THE BETTER HOMES MANUAL

Edited by
BLANCHE HALBERT

THE UNIVERSITY OF CHICAGO
HOME ECONOMICS SERIES

LYDIA J. ROBERTS
Editor

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THE BETTER HOMES MANUAL

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Edited by

BLANCHE HALBERT

Research Director, Better Homes in America

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PREFACE

By RAY LYMAN WILBUR

Secretary of the Interior and President of
Better Homes in America

Good public policy involves provision for informing the general public on the practical details of house architecture, construction, and equipment, and each of the processes involved in the purchase or financing of the house and the management of the home. This is a field in which science is making rapid progress and in which there are, therefore, new processes to be brought to public attention, and where the results of large numbers of studies and experiments should be made accessible to all householders and homemakers.

In this *Manual* are assembled the best contemporary statements obtainable on home ownership and financing, the methods of keeping the cost of the house down, points to be considered in the buying or building of a home, the selection of the site, and the fitting of the house to its site, the determination of architectural style and consideration of essentials in planning as well as the choice of materials to be used and selection of equipment for lighting, heating, ventilation, plumbing, and refrigeration, and the finishing of floors and walls. These are matters on which many government departments, state colleges, professional organizations, and periodicals publish thousands of articles of varying merit. The householder or home builder may be easily perplexed or confused by the quantity of the available information or material, much of which is biased, incomplete, or inadequate. Access, therefore, to the best of contemporary advice on these subjects saves time and effort and conserves public resources.

Once the house is completed, and even before that time, problems of the selection and arrangement of furniture, selection of draperies, curtains, and pictures must be considered; and the setting of the house with reference to landscaping or the designing and planting of home grounds requires consideration, so that home and community values may not be impaired but actually enhanced. The solution of each of these important problems of the home inevitably involves a consideration of standards of housing and ideals of home life, on the one hand, and careful organization

of economic resources through skilful budgeting and home management, on the other. Each must be considered with reference to the whole picture if the best effects are to be secured.

The purpose of this *Manual* is to assist the new generation of leaders in home improvement—teachers of home economics, home-demonstration leaders, members of home bureaus, and Better Homes committees as well as home owners and homemakers—to have access to the best available sources of information on each detail of home improvement.

INTRODUCTION

By JAMES FORD
Executive Director of Better Homes in America

The significance of the home is indicated by examination of the effects of environment upon human character and activities. Each individual at birth is gifted with actual or potential qualities which can be traced to heredity. Each is a unique combination of such traits or qualities, and to this unique pattern of traits and tendencies he owes his individuality. From the very beginning of life, however, he is subject to influences from his environment, and these influences to a large extent determine his development.

A simple analogy from the plant kingdom may make this clear. For it is possible to select seeds from the best plants—seeds which embody the type of heredity desired such as large and vigorous growth or flowers and fruits of particular color, size, and quality. If environment played no part in the life of the vegetable kingdom, all such seeds when planted would result in plants of high quality. The careful horticulturist, however, realizes that it is necessary to pay careful attention to the kind of environment in which such seeds shall be placed. If the soil is too dry, the seeds will not germinate or the plant will be stunted. If too continuously moist, the plant may rot. The most vigorous growth is secured through proper combinations of soil, moisture, climate, and fertilization. A wholesome development of even the best selected seed thus may be prevented by improper or unfortunate conditions of environment.

The same is true of human beings. Children of the best heredity or of the best native endowment may be prevented from the high development which is their due by unfortunate circumstances of their upbringing —that is to say, by undesirable environing conditions. On the other hand, the children of average hereditary stock may do better than those of good stock if the conditions of growth are more fortunate. This book is not concerned with the social control of heredity but deals with the selection, cultivation, and control of the more important environing factors in the lives of children and adults.

The home is the environment in which the life and development of the child are primarily determined. In the early years practically all the life

of the child is lived in the home, and even in adult years men or women who work outside of the home spend from one-third to one-half of their time in the home. The homemaker spends the greater part of her time in this environment. From the quantitative point of view, therefore, the home is the most important of human environments, and if its influences are good the prospects for development on the part of each of its members likewise will be good.

So far we have spoken of the home as if it were one environment, but it is probably made up of hundreds or thousands of influences some of which are amenable to elimination, cultivation, or control. Its influences comprise each detail in the actual physical environment—the design of the house, each article of equipment, the pictures on the walls, the books and magazines upon the table, the arrangement of furnishings, as well as the backgrounds, interests, ideals, and attitudes of each member of the family. The influences of the home invariably comprise subtle and intangible factors as well as physical factors. The making-over of home influences, therefore, must involve conscious selection of attitudes and ideals as well as of furnishings, pictures, equipment, or other factors primarily physical.

The improvement of homes is a primary means to the development of individual character. It is, however, of tremendous sociological importance as well, because through the conscious selection of environing factors in homes which are the chief environment of children it becomes possible in the long run to redirect the trends of civilization. Wherever homes can succeed in helping each child to realize its hereditary potential, i.e., to develop physical health, mental stability and alertness, emotional control, and interest in life's higher values in just so far as his native equipment may permit, social institutions will inevitably reflect these qualities and standards. For the boys and girls influenced and trained in their home environment to do their best with the abilities with which they were endowed by heredity will demand standards in business and public life as high as those which have been cultivated in their homes. Herein lies great promise for human development even in the absence of social control of heredity.

The home because of its universality has been taken too much for granted and subjected to relatively little study. Families have drifted into home ownership or tenancy with only the meager knowledge of the subject which they could pick up from their own earlier lives and contacts with friends and business associates. The inevitable result has been

that most families are dwelling under conditions ill adapted to their needs and far from ideal. Health is injured by defects in house design, equipment, or maintenance which could be easily remedied. Life and limb are endangered by defects which could be eliminated with slight expenditure of time or money. Precious hours are needlessly wasted at housework which could be saved by intelligent re-routing of activities, better arrangement of equipment, or installation of labor-saving devices. Rest and comfort may be missed through lack of appreciation of the ways through which they can be attained, and the fine values of beauty and privacy so essential to individual growth and development may be missed through a failure to appreciate their importance and the possibility of incorporating them even in the most humble dwelling.

The solution of the urgent problem of home improvement is twofold: It involves reaching the householders of the present with information adapted to their interests and needs, and cultivation of initiative in coping with the problems which they face. It demands also the cultivation of trained leadership through our public schools, normal schools, and colleges, through which each present and future homemaker or householder may be helped to the detailed and specific information needed. With every family the problem is to determine what are the next steps which should be taken in the improvement of existing conditions—but those next steps should be determined with reference to ultimate goals. Advice and help are needed.

Much waste of time, energy, and family resources has been caused by ignorance of the best ways of going about the purchase and planning, the repair, or the management of a house. From the point of view of the individual householder, building or purchase of a home may be the most important investment of a lifetime. Viewed from the standpoint of public welfare, conditions of housing are a matter of public concern, because unfortunate mistakes in the design or construction of a single house, in its placement, or mistakes in the selection of the site, may mar the entire neighborhood, and affect the property values, tax rates, and the general well-being of many citizens.

The home, however, should not be an end in itself but a means to the fulfilment of high ideals, of happiness, of family life. Each member of every family should have opportunity at all times to maintain sound health, develop his personal capacities, and grow in character. The home may be made a means, also, of providing opportunity for creative self-expression in each of the arts in which the individual is interested or

gifted, and may thus become a medium through which the deepest of human interests are elicited and trained. Too narrow a conception of the possibilities of the home may lead to moral lethargy; but the development of an understanding of human potentials and of what homes may furnish as a developmental center may provide opportunity for each member of a household to discover himself and organize his life under the most favorable conditions for mental and moral growth, for creative activity, and for service to his community.

The conditions of housing and of home life have been shown to be a matter of public concern. National progress is limited by present conditions of housing which injure health or thwart individual development. Hence, our state and municipal governments have recognized their responsibility by enacting laws governing health, building, and housing, in order to establish certain minimum standards below which no house should be permitted to fall. Civic progress requires a continuous upward pressure upon these standards and frequent revision of the laws already in operation. Within the past few years building laws have been supplemented by zoning legislation in our cities and towns and provision for the careful planning of the city as a unit, both to prevent conditions which may hamper commerce and industry and to provide for the wholesome development of residential districts in their relation to civic, cultural, commercial, and industrial centers. The aim of city planning is to provide a maximum of the amenities of life for all citizens. The home is no longer construed to be an isolated unit, but is recognized as an important factor in the social process. Through the study of housing legislation and city planning the householder and the homemaker become increasingly aware of their civic opportunities and responsibilities as home owners, neighbors, and citizens. Through organizing local civic groups to represent their neighborhood and community at hearings where local or state housing legislation is under consideration they may provide for the protection of their districts, for orderly growth, and for increasing access to the values of home and community life.

Many organizations are engaged in work of one sort or another for the improvement of housing. These include departments of our municipal and federal governments, extension departments of public and private colleges and universities, and civic organizations on a local, state, or national basis concerned with a wide range of problems in the field of architecture, home and community beautification, home economics, slum elimination, city planning, and the development of cultural opportunities and other re-

lated subjects. Training for civic leadership involves an understanding of all such community and national resources, so that they may be properly co-ordinated for effective achievement and with a minimum waste of community resources and effort. Through perfecting the service rendered by these various agencies and through well-conceived researches to discover the best available means to the fulfilment of home and community ideals it is possible to speed up the process of home and community improvement for rural districts and for cities. Bit by bit the difficult and serious problems of slum elimination, of the protection of homes from deleterious influences, and of promoting orderly development of residential districts with individuality and quality in the architecture of houses and in the community as a whole may be mastered. These problems will not be solved, however, until every American citizen is able to dwell in a home that is sanitary, convenient, and comfortable, attractive, wholesome, free from influences that thwart development, and conducive in every way to the fulfilment of high ideals.

In a nation with vast economic resources, relative prosperity, and high ideals of popular representation in government, such an ideal is not visionary. Even though a century or two may be necessary for its accomplishment, the beginnings may be made at once in framing a comprehensive program and existing agencies may be used in a practical way to fulfil this ideal step by step. Such a program involves the same kind of research, judicious planning, and continuous painstaking activity that is involved in our great industrial and engineering projects. Too generally sentimentalism and shortsightedness have dominated activities for social welfare. The constructive genius displayed in business enterprises and the professional skill displayed in private, professional activity must be coordinated with a high conception of civic responsibility, with patient and well-devised planning, and with a growing vision of the ultimate aim. It is the privilege of every business and professional group and of every citizen and householder to participate in this program for home improvement.

TABLE OF CONTENTS

PART I. THE REQUIREMENTS FOR A GOOD HOME

PART III. ORGANIZATIONS ENGAGED IN HOUSING AND HOME-IMPROVEMENT WORK

PART I

THE REQUIREMENTS FOR A GOOD HOME

CHAPTER I

HOME OWNERSHIP AND HOME FINANCING

HOME OWNERSHIP[1]

BY HERBERT HOOVER

Buying or building a home requires the use of sound judgment in seeing that the personal needs of the family are best met with the funds available. It involves not only the carrying on of transactions of financing and buying or building, but it involves the proper determination of location with respect to school, to work, and to neighborhood.

Maintaining a high percentage of individual home-owners is one of the searching tests that now challenge the people of the United States. The present large proportion of families that own their homes is both the foundation of a sound economic and social system and a guarantee that our society will continue to develop rationally as changing conditions demand.

A family that owns its home takes a pride in it, maintains it better, gets more pleasure out of it, and has a more wholesome, healthful, and happy atmosphere in which to bring up children. The home-owner has a constructive aim in life. He works harder outside his home; he spends his leisure more profitably; and he and his family live a finer life and enjoy more of the comforts and cultivating influences of our modern civilization. A husband and wife who own their home are more apt to save. They have an interest in the advancement of a social system that permits the individual to store up the fruits of his labor. As direct taxpayers they take a more active part in local government. Above all, the love of home is one of the finest instincts and the greatest of inspirations of our people.

To-day, in the period of post-war recovery, when our National productivity is increasing, we have the opportunity to make definite progress in the right direction. Moreover, the development of the automobile has given a great impulse to suburban life and an increasing possibility of home ownership. Happily, a large section of the people is awake to the

[1] Adapted from Foreword to *How To Own Your Home* (Washington: Better Homes in America, 1929) and from "Home Building and Home Ownership," *Child Welfare Magazine*, April, 1927.

Fig. 1.—Attractively designed, conveniently planned house which received a Better Homes architectural merit award in 1930. Note the suitability to the particular site. (Stanley H. Withe house, Raymond J. Percival, architect, Hartford, Conn.) See floor plans on next page.

problem, and an increasing number of business groups have publicly acknowledged their responsibility and interest in it. They realize that un-

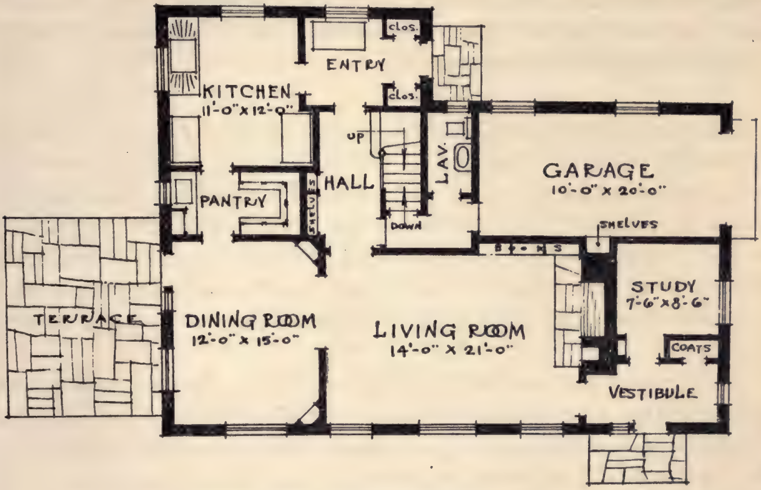

FIG. 2.—First-floor plan

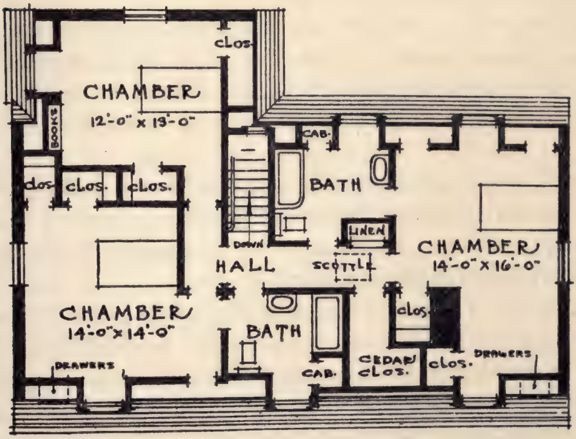

FIG. 3.—Second-floor plan

necessary barriers that may encompass a man determined to own his home are hindrances to good community spirit and to good business. They see that taking a neighborly interest in developing sound financing and other

machinery for the use of home-seekers, and insisting on the observance of honest, straightforward methods by those who deal with home-seekers is not paternalism but good business and good citizenship. It is the "square deal"—and it is not only right but essential that the cards should not be stacked against the home-seeker.[1]

If our standards of housing are not to lag behind our improving standards in the matter of food, clothing, education and recreation, we must count first of all on the energy and resourcefulness of individual families which determine to own their homes and have the character and ability to save up the amount of a first payment. For the demand for attractive, livable homes from families who can make a substantial first payment is the most dependable force to insure the building of the right kind of homes.

This demand can be encouraged and made more effective, from an economic point of view, by improved home financing facilities, especially in the field of second mortgages, by increasing efficiency within the construction industries, by improved layout of new residential areas, and by the co-operation of local governments in assuring orderly civic development through good city planning and zoning.

Rising standards for owned homes should tend to raise the standards of rented homes, which we may consider auxiliary. We have ample evidence that too great reliance on rented dwellings tends in the modern industrial state to inadequate housing and the demand for state participation in housing.

The large home-building program of the past five years has undoubtedly been instrumental in the maintenance of stable employment and prosperous business conditions, and a continued demand for homes is always a healthy factor in the general business situation.

When a family or a state or a nation does not pay enough attention to the future consequences of its acts, it is in peril. Looking to the future is a point of view which permeates a man's whole attitude and outlook on life. The home-owner, or the man who sees home ownership just ahead, inevitably has that point of view strengthened. While the home-owner's judgment as to the future may be warped in some cases, at some times, and there is always a need for liberality and thought and wisdom in meet-

[1] Foreword to *How To Own Your Home* (Washington: Better Homes in America 1929).

ing changed conditions, surely, the greater the number of home-owners, the greater confidence we may place in the future of our country.

Certain clear obligations rest upon us of the present generation. It behooves parents to achieve home ownership so far as they are able. We all ought to promote better facilities for the use of others who are striving to own their homes.[1] . . . .

HOME OWNERSHIP AND HOME FINANCING[2]

By JOHN M. GRIES

Executive Secretary of the President's Conference on Home Building and Home Ownership

AND

JAMES S. TAYLOR

Chief of the Division of Building and Housing, U.S. Department of Commerce

The great majority of people have a strong desire to own their homes. Some, to be sure, are forced to move frequently from city to city, and others have not yet saved up enough to make the first payment on the purchase of a home. So there is always a need of houses to rent. But an owned home with its many satisfactions is the ideal that most families wish to secure for themselves. . . . .

The home-owner is master of his dwelling. He cannot be ordered to vacate, and the rent cannot be raised. He can make alterations as he sees fit, and money spent for improvements adds to the value of his own property. His family feels a sense of security, and finds a stimulant in earning and saving to pay for the home and in making it attractive. Such are the rewards that each year lead hundreds of thousands of American families to buy or build homes for themselves.

It is believed that those who can afford to buy or build a home will find help and encouragement in the following pages.

The buying or building of a home deserves serious consideration. . . . . It may take a few days or weeks to assemble the information any home-seeker should have in hand before he takes the decisive step that will commit him to pay a large part of his annual income for ten or fifteen years and which will probably determine the neighborhood in which his chil-

[1] *Child Welfare Magazine*, April, 1927.

[2] Adapted from *How To Own Your Home* (Washington: Better Homes in America, 1929), pp. 5–13, 29–32.

dren will be reared. Would any man buy a partnership in a business with less knowledge?

The pleasures and advantages of owning a home may be lost through worry about overdue payments, poor construction, or an unpleasant neighborhood. So it pays to make a careful decision and avoid such worries.

It is hoped that those families who are not yet in a position to own a home, but who want to take the step, will also find this information helpful, for homes may be purchased on a small down payment and monthly instalments like rent. A family that has saved up enough to make a first payment and has paid its rent regularly when due has given good evidence of its ability to pay for and own a home.

Preparations for home ownership cannot begin too early. The determination to acquire a home some day, and the belief that owning one is a normal part of a well-rounded life, are the first essentials, and can be shared by children and their elders alike. Homes are usually bought from savings. Habits of saving are best begun in early childhood; but adults who have not already begun to save toward buying a home should start at once. Again, a person cannot begin too young to observe the different types and features of houses; such observation is useful in making a wise purchase.

Many find the buying of a home the largest investment they ever make. It is a very important step. A purchase made wisely may be the stepping-stone to advancement and happiness, while a mistake may cause discouragement and a loss of all one's savings.

Most men and women who buy a house have never done it before, and are usually unskilled, as people generally are in the things they do but once or twice in a lifetime. But lack of experience should deter no one.

There is a story of a man who, many years ago, came to Broadway at Times Square, and decided to wait until he believed it would be safe before crossing the crowded street. Twenty years have passed, and he is still waiting for absolute safety. The story of many a family that has been ready to own a home is only too similar.

The prospective home-owner who uses his common sense in considering the real needs of his family and his ability to pay, and who checks his own judgment by consulting experienced persons, may go ahead with full confidence. He need not be frightened by the mistakes of heedless persons who have been carried away by some novel feature and coaxed into a bad bargain, or who have tried to buy beyond their means. While some risks

are involved, as is usually the case in obtaining anything worth while, the danger of failure is relatively small when weighed against the advantages of an owned home.

How much can one afford to pay for a home?—Every family must face this question. Most people know what they would like in the way of a home, and know that they could make payments at least equal to the rent they are now paying. When they look over houses, or plans of houses, they find some that cost too much and others that are too small or too shabby to consider. The real problem lies in getting a satisfactory home, one that will not absorb too much of the family's income nor yet be below its general living standards. Before buying, the head of the family may wisely ask himself:

1. What is the family's annual income, and what will it probably be next year and the year after?
2. If business slackens, is he likely to lose his position or have his earnings reduced?
3. Will anyone else in the family be able to earn an income?
4. What does the family now pay for rent each year?
5. How much of the income is being saved?
6. How much could the family afford to pay out each year in paying for a house, and for the expenses that go with it?

The range of safe expenditure.—It is a mistake to buy beyond one's ability to pay, for that usually results in the loss of the home or in a most discouraging struggle. The purchase should be safe; thus, if a family cannot pay $7,500 for a house, a $5,000 house may be within its means.

The amount that can be paid for a house depends partly on what interest rates are charged for the money borrowed to make the purchase and the rate at which the principal is to be paid off. These fixed payments must be met regularly, and they must be met from the family's income. It is, therefore, always best to leave some margin of safety to provide for illness or other emergency. While one may be too optimistic when an attractive house is in view, and count on increased income that he may never receive, nearly every family can and should cut down other expenses when the savings are to be invested in a home.

Percentage of income to devote to payments.—If a certain family pays a sixth of its income for rent, it may be able to devote one-fourth or more to buying and maintaining a house, for the amount thus used may include both rent and savings. Rent, or payments on a home, may require anywhere from one-eighth to one-third of the family income, depending on the

special circumstances in each case. In addition to interest payments and installments on the principal of a loan, allowance must be made for renewals and repairs, taxes, special assessments, insurance, water tax, and various accessories and improvements. Families accustomed to living in apartments sometimes fail to allow for the cost of fuel for heating purposes. . . . .

Where does money count for most?—Usually a house can be obtained for less than the amount a family could pay if it were pressed to the limit. Every family wants to spend its money so that it "goes the farthest," and the exact amount to be spent on a home can be determined wisely only by carefully checking over the family's needs and its expenses. There are, first of all, the obvious budget items of food, shelter, and clothing. Proper nutrition, especially, should not be neglected. In addition, there are expenses such as life insurance, doctors, hospitals, etc. If there are children, it may be wise to send them away to school, to buy a piano for their use, or to give them other advantages which cost money. Every family needs a vacation and some recreation, and every family wants to contribute to worthy causes. Phonographs and automobiles or new pieces of furniture may be wanted before the house is paid for. Many other items of expense cannot well be avoided. If the amount put into a house is out of proportion to other expenditures, the result is usually regretted.

In deciding how to spend money above the simple necessities of life it is always best to note which expenditures have permanent value. Money spent to provide education and wholesome outdoor life for children, for instance, will help them throughout life, while certain expensive amusements are harmful or less wholesome than the simpler forms of play. Articles for the household that are useful or in good taste, again, may serve for many years, whereas expensive foods are quickly eaten and soon forgotten.

FINANCING PROBLEMS—SAVING, BORROWING AND PAYING BACK

The man who has enough cash to pay in full for a home has no worries about financing. Most people, however, can pay only part of the price in cash and are obliged to borrow the rest. It must always be remembered that *the more cash one can pay down* on a house *the better*.

Borrowing money to buy a home is no disgrace. On the contrary, it is normal and in many ways desirable. Many families in meeting payments on a loan have learned the habit of saving, and have continued it as a step toward financial independence.

TABLE I*

HOME OWNERSHIP IN THE UNITED STATES: PERCENTAGE OF FAMILIES OWNING THEIR HOMES BY DIVISIONS AND STATES, 1900, 1910, AND 1920
[Figures from the Bureau of the Census]

Division and State	Per Cent of Families Owning Their Homes			Decrease or Increase from 1900 to 1920
	1900	1910	1920	
United States	46.1	45.8	45.6	− 0.5
Geographic divisions:				
New England	42.0	39.7	39.8	− 2.2
Middle Atlantic	36.3	35.5	37.2	+ .9
East north central	53.9	52.8	52.3	− 1.6
West north central	58.2	58.2	56.4	− 1.8
South Atlantic	40.1	40.9	42.0	+ 1.9
East south central	42.0	42.3	42.7	+ .7
West south central	44.1	42.9	42.2	− 1.9
Mountain	57.6	58.5	55.2	− 2.4
Pacific	49.7	53.0	47.9	− 1.8
New England:				
Maine	64.5	62.3	59.6	− 4.9
New Hampshire	53.5	51.0	49.8	− 3.7
Vermont	60.1	58.4	57.5	− 2.6
Massachusetts	34.9	33.1	34.8	− .1
Rhode Island	28.6	28.3	31.1	+ 2.5
Connecticut	38.9	37.2	37.6	− 1.3
Middle Atlantic:				
New York	33.1	30.9	30.7	− 2.4
New Jersey	34.2	35.0	38.3	+ 4.1
Pennsylvania	41.1	41.5	45.2	+ 4.1
East north central:				
Ohio	52.4	51.2	51.6	− .8
Indiana	55.9	54.7	54.8	− 1.1
Illinois	44.9	44.0	43.8	− 1.1
Michigan	62.0	61.6	58.9	− 3.1
Wisconsin	66.2	64.4	63.6	− 2.6
West north central:				
Minnesota	63.0	61.7	60.7	− 2.3
Iowa	60.5	58.4	58.1	− 2.4
Missouri	50.5	50.9	49.5	− 1.0
North Dakota	79.2	75.1	65.3	−13.9
South Dakota	70.9	67.9	61.5	− 9.4
Nebraska	56.6	59.0	57.4	+ .8
Kansas	58.9	59.1	56.9	− 2.0
South Atlantic:				
Delaware	36.2	40.6	44.7	+ 8.5
Maryland	39.7	43.9	49.9	+10.2
District of Columbia	24.0	25.2	30.3	+ 6.3
Virginia	48.2	51.2	51.1	+ 2.9

* *How To Own Your Home*, p. 3.

The above table shows that in 1900, out of every 1,000 families in the United States, 461 owned the homes they lived in, while in 1920 the proportion had dropped to 456 out of every 1,000 families. Twenty states and the District of Columbia showed an increase in percentage of home ownership, while the remaining 28 States showed a decrease. The 10 leading States in respect to home ownership in 1920 were, in order, North Dakota, Wisconsin, South Dakota, Idaho, Minnesota, Montana, Utah, Maine, New Mexico, and Michigan.

TABLE I—*Continued*

Division and State	Per Cent of Families Owning Their Homes			Decrease or Increase from 1900 to 1920
	1900	1910	1920	
South Atlantic—*Continued*				
West Virginia	54.1	49.2	46.8	− 7.3
North Carolina	46.0	47.0	47.4	+ 1.4
South Carolina	29.9	30.6	32.2	+ 2.3
Georgia	30.0	30.4	30.9	+ .9
Florida	46.1	43.7	42.5	− 3.6
East south central:				
Kentucky	51.2	51.4	51.6	+ .4
Tennessee	45.8	46.7	47.7	+ 1.9
Alabama	33.9	34.9	35.0	+ 1.1
Mississippi	34.2	34.0	34.0	− .2
West south central:				
Arkansas	47.2	46.4	45.1	− 2.1
Louisiana	31.0	32.0	33.7	+ 2.7
Oklahoma	54.0	45.4	45.5	− 8.5
Texas	46.3	45.1	42.8	− 3.5
Mountain:				
Montana	56.0	59.3	60.5	+ 4.5
Idaho	70.7	67.3	60.9	− 9.8
Wyoming	53.9	54.1	51.9	− 2.0
Colorado	46.3	51.3	51.6	+ 5.3
New Mexico	68.0	70.3	59.4	− 8.6
Arizona	56.8	48.9	42.8	−14.0
Utah	67.5	64.6	60.0	− 7.5
Nevada	65.8	53.3	47.6	−18.2
Pacific:				
Washington	53.9	57.1	54.7	+ .8
Oregon	58.1	59.7	54.8	− 3.3
California	46.0	49.4	43.7	− 2.3

Saving required.—Most families who buy a home must pay for it out of their own savings.

Usually it is desirable for them to possess, free from obligation, at least one-fifth, or 20 per cent, of the value of the house and lot in cash. While arrangements often are made for a purchase with less, a larger cash payment helps to insure a loan at a low rate of interest and one that can be comfortably paid off.

In rapidly growing cities with increasing land values, the risks taken by lenders are not so great, and it is generally easier to borrow up to a larger percentage of the value of the property bought, although for the purpose of a home an increase in land values may be of no advantage, since one result is to increase taxes. After the first payment is made, a family should be prepared to devote a certain amount of current savings toward paying off the loan at regular intervals.

Saving with a budget.—It is necessary to determine how much money can be set aside to carry out the plan. Economy and saving are necessary. What present expenses can be cut down? A definite plan for the future will best furnish the basis for a division or "budget" of one's income. One way is to make a table of the regular monthly expenditures, with the amount necessary for each item, by the week, month, or year. The budget thus made should be given a fair trial, and each item made to come within the limit set for it. If funds are being continually borrowed from one purpose to be spent for another, the budget loses its value.

Safety for savings.—Savings should be placed where they are fully safeguarded, yet yield a fair rate of interest. In general, it is well to have them in a financial institution which loans money on real estate, for preference in loans is often given to stockholders and depositors. Building and loan associations usually lend most of their available funds on real estate, particularly to home-owners, and at the same time they pay a fair rate of interest to depositors. Some banks, especially savings banks, loan largely on real estate and maintain a real estate department for that purpose.

Where not to put savings.—Ingenious schemes are used by dishonest companies to attract savings from the unwary home-seeker. Some promise high dividends to investors, and also the chance to obtain loans below the market rate of interest. Such schemes are obviously not to be trusted.

A number of concerns advertise loans at a low rate of interest, when it really turns out that interest is still charged on the full amount of the loan even after half or three-quarters of it is paid off. This makes the real rate very high. In some excellent building and loan associations, however, the nominal payment of interest at a fixed legal rate on the whole amount results in quicker retirement of the loan.

Certain "loan trusts" that are run for the profit of the promoters have advertised that they will lend money to home-buyers at 3 per cent. But they pay no interest at all to depositors who are lured in by doubtful promises of the chances of obtaining "cheap" loans. This method is unbusinesslike. The first few customers, often "insiders" representing the promoters, may obtain loans cheaply. But they do so only at the expense of later depositors who may receive no interest at all on their deposits for years, and who may not be able to borrow when they need funds, or before the company goes out of business. Such a company, as has been said, borrows money from its depositors and pays them no interest; it lends the money at 3 per cent. Thus, as long as it operates, it absorbs three times as much for expenses and profit as an ordinary well-run building and loan association. Many sound organizations of the latter type, for example,

pay 5 per cent interest on deposits and lend the money out again at 6 per cent, retaining only 1 per cent as a charge for doing business.

In every case an investor should note whether he will receive a fair rate of interest if he should discontinue payments or withdraw his deposits at any time; this should not bring a severe penalty. Plans which propose to profit by the inability of any person to make payments are essentially unsound.

It is a safe rule never to invest money in the stock or security of a concern unless the management is in the hands of men known to be capable and honest. High rates of interest and the safety required for investment of savings intended for home-buying usually do not go together. American people lose several hundred million dollars of their savings each year by purchasing worthless securities promising large returns.

Speculation in lots.—One of the most common ways in which savings are lost is through speculation in real estate. Buying a lot in an improved section when one is ready to build is far different from buying a city or suburban lot where streets have not been put through, and where no water, gas, or sewer mains have been laid. Such a purchase is always in the nature of a speculation. It is well to remember that taxes must be paid on every lot and sometimes special assessments, too. The outgo in holding a lot is certain; profits are uncertain. Money in a savings account, on the other hand, keeps on earning interest for the depositor.

Policy loans unwise.—Some home-buyers have borrowed cash on their life insurance policies in order to meet their first payment. This action is almost always improvident. It deprives the borrowers' families of the full protection the life insurance should secure them. The presidents of many of the most important life insurance companies advise strongly against policy loans, even though their companies assume no risks in making them.

A loan on an insurance policy, however, is not to be confused with an ordinary real estate mortgage loan which an insurance company may grant. Many of the companies which regard loans on policies as being against the real interest of policyholders take pride in the number of their mortgage loans to home-owners.

Mortgages.[1]—First mortgages: Obtaining a loan with which to pay the balance between the first cash payment and the total cost of a piece of property is usually a simple matter when the amount paid down amounts

[1] Mortgages and sources from which money may be borrowed are discussed more fully on pp. 23–36.

to 40 or 50 per cent of the whole purchase price. The problem becomes harder as the proportion to be borrowed grows larger. No matter what loans are required, it is always best for a person without experience in real-estate matters to borrow from a responsible loaning institution, if only for the benefit of its advice in the matter of the validity of the title, seeing that all back taxes and special assessments are paid, that insurance is kept up, that there are no mechanics' liens or other claims against the property, and that the price paid is reasonable and the value of the property not likely to fall within a few years. The fees charged and services rendered by different institutions in arranging a loan may differ substantially and may more than offset a difference in interest rates. In most cases a loan from a good bank, building and loan association, or insurance company is an assurance that it thinks the proposition sound.

When money is borrowed for the purchase of a home the lender generally requires a mortgage or trust; that gives him the right to have the property sold at auction in case promised payments on the interest or principal of the loan are not made regularly. A first mortgage up to 50 or 60 per cent of the value of a house and lot is considered one of the safest possible investments, and it should be easy to obtain such a loan from a building and loan association, savings bank, insurance company, trust company, or from some individual—perhaps the seller of the house.

Second mortgages: In many cases, however, it will not be possible for the buyer to borrow all the money he requires on a first mortgage, and he may have to borrow additional funds on a second mortgage or note. The holder of the second mortgage takes more risk, consequently rates of interest on second mortgages usually run higher.

Bonuses or commissions of as much as 10 per cent are sometimes required for placing a second mortgage.

The character of the home-seeker is often a deciding factor in his ability to obtain a second mortgage on reasonable terms.

Discounts on second mortgages: The contractor who builds a house may take such a mortgage himself and expect to sell it at a quarter or a fifth less than its face value. This fact should be borne in mind, and the contractor should charge less for the house if the buyer can pay cash. Second mortgages are sometimes obtainable from companies which make a speciality of such business, from employers, and from relatives, friends, and other individuals with money to lend.

Lender must be honest.—The lender, if unscrupulous, may encourage the purchase of an expensive piece of property when he is confident the buyer

cannot meet the payments, so that he can foreclose the mortgage and buy back the property himself at a forced sale, when prices may be low. This is an additional reason for dealing with a responsible institution, which will usually advise against a purchase beyond one's means.

Financing during building.—If the owner retains the title to his land and pays the contractor as the work progresses, he may have to make some special arrangement to borrow money before the house is complete. He will, of course, have to pay interest on the sum so borrowed while he is still paying rent, and he may consider the interest he pays during the construction period as a part of the first cost of his house.

Borrowing from building and loan associations.—Building and loan associations will, in many cases, prove the best means of financing a home, for they are often able to loan as much as 70 to 80 per cent of the real value of a home, which is generally above the limit allowed by law for savings banks and insurance companies. Such a loan, therefore, may avoid the added complications, disadvantages, and expenses that may be involved in case both a first and second mortgage are required. Building and loan associations are often especially helpful in providing means of financing during the construction of a new home. They are usually organized with the chief aim of assisting home-buyers and home-builders. Their system of selling shares on which payments must be made weekly or monthly has proved an invaluable aid to hundreds of thousands of future home-buyers in accumulating savings and furnishes a sound and helpful scheme for paying off the principal of loans.

The officers of these associations are generally able to give very good advice to home-buyers and frequently help them to avoid unwise purchases. (For additional information, see pp. 29–31.)

Purchase where title does not pass at once.—In some states cases arise where better terms can be made when the title does not pass to the buyer as soon as he occupies the home, but remains with the seller for a few months, until the cash payments amount to 25 or 30 per cent of the total value of the property.

Agreements under these general circumstances assume a variety of forms. It is especially important that the legal details be sound in every respect and that the integrity of the seller be well established. . . . .

Paying off the loan by installments.—No matter how little or how much one has to borrow, it is good policy to pay off part of the loan at regular intervals. This process of paying off the principal a little at a time is called *amortization*. Thus, on a loan of $1,000 at 6 per cent interest, payments of $10 a month, or $120 a year, will take care of the interest on the loan and

cancel the principal in less than twelve years, leaving the home free of debt. The president of a large savings bank, who has also been president of the savings bank section of the American Bankers' Association, states: "Paying off a loan in installments is like attacking an army in detail. The borrower, instead of having one large payment to look forward to, has a succession of moderate payments, which can be easily met."

The payments agreed on for amortization are usually met regularly, so that the loans are paid off steadily out of savings. This reduces the interest charges and leaves the family much better off financially in case of death or misfortune. Where no amortization is agreed to, on the other hand, many loans are not reduced before they fall due, and savings have not been built up to pay them off. Such loans sometimes drag along for a lifetime, and may be foreclosed when they cause great distress. The prudent course is to start paying off the loan as soon as the purchase is made. Most building and loan associations provide that the loan may be paid off sooner than its maturity if the borrower so desires, and without disadvantage.

No mortgage on a home should be regarded as permanent, for if there is a shortage of mortgage money when it falls due there may be difficulty about renewing it. In the case of second mortgages, especially, this is important, and they should be amortized as quickly as possible.

FINANCING TABLE

Table II recognizes the fact that families having the same annual income may not be able to devote the same amount toward the purchase of a home. A family, for example, with several small children and perhaps other dependents, living in a city may not be able to put much aside toward buying a home. Another family with the same income but with no children or dependents, situated in a village where living costs are low, can afford to pay out a very much larger proportion of its income toward buying its home. The overlapping incomes in the table are thus necessary to cover even ordinary differences in the amounts that families with the same income will be able to spend toward a home after they have paid for food, clothing, and other necessities.

The annual expenses involved in purchasing and maintaining a home of a given price may also vary.

The table, therefore, does not attempt to set up arbitrary standards, although it is fairly typical and should be useful as a basis from which to start figuring.

TABLE II

Table Showing Income, Value of Home, and Typical Annual Expenses for House and Lot

SECTION I.—CASH PAYMENT OF 20 PER CENT OF TOTAL VALUE*

1. **Value of house and lot**	**$3,000**	**$4,000**	**$5,000**	**$6,000**	**$7,000**	**$8,000**	**$9,000**	**$10,000**
2. **Annual income**	**1,200 to 1,800**	**1,600 to 2,400**	**2,000 to 3,000**	**2,400 to 3,600**	**2,800 to 4,200**	**3,200 to 4,800**	**3,600 to 5,400**	**4,000 to 6,000**
3. First cash payment (20 per cent of value)	600	800	1,000	1,200	1,400	1,600	1,800	2,000
4. Amount of loan	2,400	3,200	4,000	4,800	5,600	6,400	7,200	8,000
5. Interest and amortization (12½ per cent of loan)	300	400	500	600	700	800	900	1,000
6. Estimated taxes, insurance, and upkeep	120	160	200	240	280	320	360	400
7. **Total annual expense**	**420**	**560**	**700**	**840**	**980**	**1,120**	**1,260**	**1,400**
8. Savings included in above total (first year)	150	200	250	300	350	400	450	500
9. Expenses comparable with rent (first year)	270	360	450	540	630	720	810	900

* Assuming an initial cash payment of 20 per cent of the total value, the annual cash outlay (item 7) in this section is about as low as can ordinarily be arranged for the first few years. The financing charge might be cut down later on, when part of the principal of the loan has been paid off, but the whole debt will be canceled in about twelve years if the payments given in the table are continued regularly. (See General Notes, pages 20–22.)

TABLE II—*Continued*

SECTION II.—CASH PAYMENT OF 30 PER CENT OF TOTAL VALUE†

1. **Value of house and lot**	**$3,000**	**$4,000**	**$5,000**	**$6,000**	**$7,000**	**$8,000**	**$9,000**	**$10,000**
2. **Annual income**	**1,200 to 1,800**	**1,600 to 2,400**	**2,000 to 3,000**	**2,400 to 3,600**	**2,800 to 4,200**	**3,200 to 4,800**	**3,600 to 5,400**	**4,000 to 6,000**
3. First cash payment (30 per cent of value)	900	1,200	1,500	1,800	2,100	2,400	2,700	3,000
4. Amount of loan	2,100	2,800	3,500	4,200	4,900	5,600	6,300	7,000
5. Interest and amortization (12 per cent of loan)	252	336	420	504	588	672	756	840
6. Estimated taxes, insurance, and upkeep	120	160	200	240	280	320	360	400
7. **Total annual expenses**	**372**	**496**	**620**	**744**	**868**	**992**	**1,116**	**1,240**
8. Savings included in above total (first year)	126	168	210	252	294	336	378	420
9. Expenses comparable with rent (first year)	246	328	410	492	574	656	738	820

† Assuming an initial cash payment of 30 per cent of the total value, the annual cash outlay (item 7) in this section is about as low as can ordinarily be arranged for the first few years. The financing charges might be cut down later on, when part of the principal of the loan has been paid off, but the whole debt will be canceled in about twelve years if the payments given in the table are continued regularly. (See General Notes, pages 20–22.)

TABLE II—*Continued*

SECTION III.—CASH PAYMENT OF 40 PER CENT OF TOTAL VALUE‡

1. **Value of house and lot**	**$3,000**	**$4,000**	**$5,000**	**$6,000**	**$7,000**	**$8,000**	**$9,000**	**$10,000**
2. **Annual income**	**1,200 to 1,800**	**1,600 to 2,400**	**2,000 to 3,000**	**2,400 to 3,600**	**2,800 to 4,200**	**3,200 to 4,800**	**3,600 to 5,400**	**4,000 to 6,000**
3. First cash payment (40 per cent of value)	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000
4. Amount of loan	1,800	2,400	3,000	3,600	4,200	4,800	5,400	6,000
5. Interest and amortization (12 per cent of loan)	216	288	360	432	504	576	648	720
6. Estimated taxes, insurance, and upkeep	120	160	200	240	280	320	360	400
7. **Total annual expenses**	**336**	**448**	**560**	**672**	**784**	**896**	**1,008**	**1,120**
8. Savings included in above total (first year)	108	144	180	216	252	288	324	360
9. Expenses comparable with rent (first year)	228	304	380	456	532	608	684	760

‡ The total outlay (item 7) in this section is based on the assumption that a family able to pay 40 per cent of the value of a home in cash will normally find it best to pay off the loan in installments, at least as rapidly as in the preceding cases. (See General Notes, below.)

NOTES ON FINANCING TABLE

The *table will not apply to every single case,* but does indicate about how expensive a home can usually be bought with a given income.

It shows cash expenditures only and *does not* outline a complete cost accounting system for home buying. The fact remains that the family takes charge of its own rent bill, and reduces the loan each month untill finally the house and lot is owned free and clear, whatever it may then be worth.

There is no calculation in the table for loss of interest on money used for the first payment, nor for loss of interest on amortization payments that might have been deposited or invested elsewhere. It is also true, nevertheless, that in most cases savings devoted to paying for a home would not be made if the family continued to rent and had not entered into an obligation to save.

Nothing is charged for depreciation, but, on the other hand, no allowance is made for possible increase in the value of the land.

If rents should rise generally there would be a further saving not accounted for in the table, and when the debt is canceled in twelve or fourteen years the only expenses comparable with rent will be taxes, insurance, and upkeep.

Item 1. *Value of house and lot.*—The value of the house and lot is the basis from which other expenses in this table are computed.

For figuring probable expenses when a home is offered at an odd price, say $4,350, the necessary percentages may be obtained readily from the last column in each section of the table by moving the decimal point four places to the left. Thus, in Section I the total annual expenses (item 7) required are 14 per cent of the value of the house and lot, and for the $4,350 house, in the case of a 20 per cent cash payment, would be $4,350 by 0.14 = $609.

ITEM 2. *Annual income.*—Of a number of families with the same income it is unlikely that any two picked at random will wish to spend the same amount for shelter. It is for this reason that the income groups in the table are made to overlap. The size of the family, its preferences as to location, the ages and number of children, varying conditions between cities, and other circumstances make the problem one that each family must solve for itself. No rule can be set up that will apply in all cases. It is assumed, however, in this table, that the value of the house and lot will lie between $1\frac{2}{3}$ and $2\frac{1}{2}$ times one's annual income, the ordinary proportion being around 2 times.

For example, a family has an income of $2,700 to start with. Then $1\frac{2}{3}$ by $2,700 = $4,500; and $2\frac{1}{2}$ by $2,700 = $6,750. The family will, therefore, expect to occupy a house worth from $4,500 to $6,750.

To illustrate differences between families, it is apparent that one living in a small town and able to have a vegetable garden and keep poultry might afford a more expensive home than a family with the same income living on a smaller city or suburban lot with higher taxes, and with street car or railway fares added to the cost of living.

ITEM 3. *First cash payment.*—Section I assumes a cash payment of 20 per cent of the value of the house and lot. Sections II and III are based on cash payments of 30 and 40 per cent, respectively, and show how much the burden of financing is reduced by a larger cash payment. As stated in the text on page 12, it is not always necessary to have as much as 20 per cent of the total value of the house and lot in hand to start with, but with less it is harder to obtain loans at a low rate of interest, and the annual financing charges become greater.

It should be remembered that in many communities there is at one time or another a shortage of money available for loaning to home-owners, and lending institutions may be able to serve the public best by lending first to those who have a large cash payment in hand. Again, where the price of homes is inflated, banks may be serving the real interest of borrowers as well as of themselves by declining to make loans for a higher percentage of current selling prices of homes.

ITEM 4. *Amount of loan necessary.*—The amount of the loan or loans required is obviously the difference between items 1 and 3.

ITEM 5. *Payments for interest and amortization.*—In Section I this item amounts to $12\frac{1}{2}$ per cent of the amount loaned as shown in item 4. This is slightly higher than the 12 per cent given in Sections II and III, because, in the first case, a second mortgage may be necessary, with less favorable interest rates or other terms. The sums paid for financing may vary, as noted under the sections of the table, and according to local prevailing rates of interest and amortization required. It generally is considered best to pay off indebtedness within fifteen years, or less, and the plan of payment should be arranged on such a basis. This does not mean, however, that mortgages should not run for a shorter period and be renewed when due. This may be best if interest rates are high at the time the loan is made.

For most families, monthly payments are far more desirable than payments at three- or six-month intervals.

Where a loan is obtained at 6 per cent interest, it can be paid off in less than twelve years by payments each month of 1 per cent of the whole original loan, totaling 12 per cent each year. If the loan is at 7 per cent interest, then only a smaller part of the regular payments is left for paying off the principal, and it will take about twelve months longer to cancel the loan than when the interest rate is 6 per cent.

One plan used by many banks and building and loan associations requires fixed monthly payments, but all sums above interest on the outstanding loan are applied directly to reducing the principal. The principal, therefore, decreases regularly and a larger proportion of the payments is used each month for amortizing the principal until the entire loan is paid off.

Under a plan used by some building and loan associations, the whole loan is nominally left outstanding until the payments in excess of interest, which are applied toward "shares," and which draw compound

interest, amount to enough to pay off the loan. Although this plan may under certain circumstances be of some disadvantage to the borrower, the net result to him, provided all goes well, is nearly the same as with the plan described above. With the same monthly payments applied against the same loan, it would be retired in about the same number of months.

Sometimes the payments for amortization are applied directly to reducing the loan and are at a fixed rate, say $250 a year for a $3,000 loan, and the interest payments, therefore, become steadily less. This plan has the disadvantage, for many people, of requiring the largest payments at first, but it is safer than plans which provide for gradually increasing total payments each year..

According to most schemes, it would be possible, after the first few years, to cut down the payments. For instance, in the tables a new arrangement at the end of seven years might reduce financing charges one-half or more, but this would mean that the loan would not be retired so soon.

ITEM 6. *Taxes, insurance, and upkeep.*—Local tax rates on real estate usually amount to 1½ to 2½ per cent of the market value of the property. Fire insurance rarely amounts to one-half of 1 per cent of the value of the house alone; yearly upkeep is frequently estimated at 1 per cent of the value of the house itself; but . . . . it varies greatly with the age and quality of the house and the attention that the owner himself gives it. In any city the tax and insurance rates can easily be found out, and it is believed that many home-owners find their expenditures for item 6 amount to less than the sums stated in the table. In each case in the table this item amounts to 4 per cent of the value of the house and lot.

ITEM 7. *Total annual expenses.*—The sums in this item are obtained by adding the amounts in items 5 and 6, so it follows that nothing is allowed under this heading for water, fuel, gas and electricity bills, telephone, special assessments, or accessories and improvements. Some of these are contingent expenses that do not have to be allowed for when a family is renting, but may add to the value of the property.

The majority of people, while they are paying for a home, probably spend between 18 and 35 per cent of their income for the purposes of item 7.

In Section I, the sums in item 7 amount to 35 per cent of the minimum income given in each column for item 2. This includes for the first year, 12½ per cent for savings and 22½ per cent for items comparable with rent. In Section III the sums in item 7 amount to 18.7 per cent of the larger incomes in item 2.

ITEM 8. *Savings.*—This item represents the amount that is *paid out* during the first year on the principal of the loan, assuming that half of item 5 is paid for interest and half for amortization. The annual savings grow larger progressively as the principal of the debt becomes less.

The amount that can be saved for amortization varies with each case. Thus, a family of two with an income of $1,800 a year, having neither children nor relatives to support, can pay off a loan faster than a family with several children and perhaps an aged parent to take care of.

ITEM 9. *Expenses equivalent to rent.*—The figures opposite this item equal item 7 minus item 8, or the difference between the total expenses for the home the first year, and the amount of savings that is used toward paying off the loan. This item grows smaller as item 8 increases, and, finally, when the home is paid for fully, the only ordinary expenses will be taxes, insurance, and upkeep.

CHOOSING A HOME FINANCING AGENCY[1]

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In attaining home ownership most American families need some financial assistance. The amount which must be borrowed represents in some cases a relatively small but more often a large part of the outlay. Although conditions vary from one section of the country to another, the extent to which borrowing is necessary generally determines the financing method employed, and for the purpose of discussing the various plans they use, home buyers and home builders who borrow may be divided into three groups, as follows:

THREE GROUPS OF BORROWERS

The first embraces those who can supply in cash 50 per cent or more of the price of the home, and who can get the remainder on first mortgage[2] from any of several different sources.

The second includes those whose cash resources are within the approximate limits of from 25 to 40 per cent, and who borrow the amount needed either on first mortgage (usually only from a building and loan association) or through the use of a first and a second mortgage.

The third comprises those who have but 10 or 15 per cent of the price, who sometimes finance through mortgage agencies, but more frequently by means of an installment purchase agreement.

First Group

Families in the first group generally experience little difficulty in obtaining the amount needed by placing a first mortgage on the property acquired. Since there are a number of lending agencies anxious to make conservative mortgage loans, the problem of these families often resolves

[1] Adapted from *Present Home Financing Methods* (U.S. Department of Commerce, Division of Building and Housing, 1928), pp. 1–12.

[2] In some localities a "deed of trust" is used in place of a mortgage. The instruments are similar in that their effect is to pledge the property as security for the loan. One important difference between the two is that, in many jurisdictions, in case of failure to make payments a forced sale of the property may be effected more quickly under the deed of trust.

itself into a mere question of choosing the one offering the most satisfactory service and terms.

BUILDING AND LOAN ASSOCIATIONS

The building and loan association is an important financing source for families in this group. These organizations make a practice of lending considerably more than half the property value where such loans are required, and they are, therefore, discussed in connection with the second group of borrowers.

LIFE-INSURANCE COMPANIES

Another source of funds for home buyers in the first group is the life-insurance company. Prior to the war most of the larger companies did not make housing loans to any considerable extent, preferring to invest their funds in mortgages on large commercial structures, thus limiting the number of their transactions and the amount of their investigational and administrative work. With the housing shortage resulting from the war and the need for broader channels of investments, however, many of these companies entered the home-loan field and they have become an important factor in the business.

The loans of life insurance companies are placed through local agents—banks, trust companies, mortgage companies, and individuals trained in the work. These agents are permitted to accept applications only in connection with properties located in developed sections where values are stabilized. The man seeking a loan to finance the purchase of a house located on an unimproved street or in a section where real estate does not sell readily will not generally be able to obtain it from a life-insurance company. Applications from borrowers on properties located in growing communities and having the advantages of modern facilities, however, are eagerly sought.

The applicant is required to supply the loan agent with information bearing on the risk, on blanks furnished for the purpose. These forms call for a variety of data, such as the location, size, and contour of the lot, the condition of the building, the materials of which it is constructed, and its heating, lighting, and plumbing system. The agent investigates the risk, appraises the property, and reports to his company. His appraisal is invariably a conservative one, and the borrower should not be surprised if he learns that the home he has contracted to buy is valued for loan purposes at a figure somewhat below the price he has agreed to pay. This valuation is not necessarily a reflection on the wisdom of the purchase,

for in determining the question of value a number of insurance companies are inclined to disregard certain items which are generally (and properly) considered by buyers and sellers as legitimate elements of worth. As an example of this, the appraisal policy of one of the largest companies in the home-loan field may be cited. This company does not allow its agents to include in their estimates of the cost of a building the builder's overhead expense, his carrying charges or profit. As a consequence of their appraisal methods the loans of the more conservative companies, though made up to 60 per cent of valuation, seldom represent more than 50 or 55 per cent of the cost of the property to the purchaser.

Insurance company loans run for periods as long as 15 years. Interest is at the rate prevailing in the locality where the loan is made, and is usually payable semiannually. In many cases the principal is required to be curtailed regularly on interest dates. The contract of one large company requires a payment of 3 per cent of the principal semiannually and gives the borrower the option of making larger payments or of taking up the entire loan after the third year. The plan of another company provides for the payment of the loan and interest in equal monthly installments over a period of 10 years. This company makes a life-insurance policy a part of the mortgage agreement, so that if the borrower should die the loan may be repaid from the insurance proceeds. In cases where such an insurance policy is involved the home-owner who wishes to sell his property shortly after the mortgage is placed is usually required to obtain the company's permission to transfer the loan to the new owner.

Insurance companies seldom lend their funds for construction purposes, and, therefore, where a family builds its home the money needed during the construction period must be supplied from some other source. The agent frequently arranges such a temporary loan, however, on the basis of his company's willingness to take over the financing when the structure is completed, and where banks and other financial institutions act as agents they often advance their own funds for the building period, after which the loan is transferred to the insurance company. Some additional expense to the borrower is usually involved in these instances.

The insurance company loan has this important advantage: It is made for a period sufficiently long to enable the borrower to repay it without the necessity of renewing, and thus to avoid the inconvenience and expense frequently incident to this process. Where amortization, or gradual repayment of the principal, is provided for, interest charges are reduced and the borrower is encouraged to get out of debt.

SAVINGS BANKS

A third lending agency, which often lends somewhat more than the insurance company, is the savings bank. The type known as mutual savings banks, found principally in the East, invest heavily in mortgages on homes.

Applications for mortgage loans are made to the real-estate department of the bank or, where no separate department has been created, to the officer appointed to pass on such applications. Appraisal methods vary. Frequently an officer or committee of the bank visits the property and determines its value by personal inspection. Under normal conditions the valuation reached is not ordinarily greatly below the market value.

In making real-estate loans savings banks are generally restricted by state laws which fix the maximum percentage of property value that they may lend. In some states this maximum is 50 per cent; in others it is as high as 60 per cent. These laws, however, do not necessarily determine whether a bank's lending policy shall be liberal or conservative.

A bank located in a state permitting the higher ratio of mortgage loan to value may be unwilling to lend up to the legal limit or may regard existing prices as inflated and fix an appraisal value well under the selling price. One restricted to 50 per cent loans may, however, appraise property at the full selling price, and advance as much or more money on a given home than the bank operating under the more liberal statute, whose policies or appraisal methods are more conservative.

Savings bank loans are frequently made for short terms— for periods of one, three, and five years—and are repayable in full at the end of the term. An increasing number of banks are making long-term loans, however, which are repayable in installments similar to those of building and loan associations, which are discussed later, and of some of the life-insurance companies. Banks making the short-term "straight" loans are usually willing to renew, but some of them make a charge for granting this privilege. Where there has been undue depreciation of the property, such as would result from the owner's failure to keep it in repair, or where its value has been lessened through changes in the character of the neighborhood, difficulty may be encountered in renewing the loan, at least in its full amount.

A number of savings banks do not lend for construction purposes, regarding these loans as a greater risk than those predicated on the security afforded by an existing building. Undoubtedly there is a larger element of risk unless special precautions are taken. The home builder or his con-

tractor may build the house of materials inferior to those called for in the plans and specifications on which the loan is based, or, through ignorance or a desire to economize, may construct it poorly. Under such circumstances the bank may find itself holding a mortgage on a home for a sum which it would not consider lending if the loan were applied for on the complete property. Banks making construction loans usually require the owner or contractor to furnish a bond guaranteeing the completion of the building according to plan, or advance the loan money in installments as the work progresses and is inspected. Few losses are suffered where such methods are followed.

It is possible for the home builder to finance through many savings banks which do not make building loans, by obtaining credit from building-material dealers for the construction period and using his available cash to pay the labor cost. The bank then lends on the completed structure and the building material is paid for with the loan funds.

Home-owners who want their loans to run five years or more frequently find that the local savings bank makes its loans payable on demand or advances funds for periods of but one, two, or three years, and home-owners who wish to amortize their loans often are unable to borrow from a savings bank on this basis. Officials of some banks restrict their loans to short terms because they feel that mortgage investments can not be readily converted back into cash in case the institution needs the funds, and therefore, plan to have these loans fall due at comparatively short intervals. Many savings banks make loans for terms of five years or longer, however, and report that they can sell such mortgages readily when funds are needed. Some savings banks and other banks which sell their loans feel that they can not put them on an amortization basis, since the investors buying them do not wish to accept small payments on the principal, but a number of the institutions are solving this problem by retaining the mortgages and selling investment certificates issued against them. These banks receive the amortization payments on the various obligations, reloan them, and add new mortgages to the group behind the certificates to keep the security constant.

TRUST COMPANIES

A fourth source of funds for families in the group under discussion is the trust company. In addition to large savings deposits, these institutions have trust funds which are available for real-estate loans. Their lending policies and methods are similar to those of savings banks.

MORTGAGE COMPANIES

In most of the larger communities mortgage companies are an important factor in home financing. There are two classes of such companies—those lending on first, or senior, mortgages and those lending on second, or junior, mortgages. The latter group is discussed in a later section.

Because of the lack of uniformity in the policies and methods of mortgage companies, no general statements can be made as to how they conduct their lending operations. They are not generally so closely confined in their activities by legal restrictions as are banks, trust companies, and insurance companies, and the use they make of their funds, whether derived from the marketing of company stock, or the sale of their mortgage investments or bonds issued against them, is therefore left more to their own discretion. Companies selling mortgages, the repayment of which they guarantee, and those whose investments are eligible for purchase by savings banks and trustees, will be found the more conservative of this class of lenders. These do not usually lend in excess of 50 per cent of their valuations, at least in the case of "straight" loans. Many of the other companies make loans larger than 60 per cent of the sale price, but usually charge a commission or a higher rate of interest than that borne by more conservative first-mortgage paper. The loans of mortgage companies are made for both short and long terms and on the amortized or straight basis. Many of the companies devote a large percentage of their funds to construction loans.

PRIVATE INVESTORS

Another group of lenders is made up of private investors. Unorganized and operating separately, their practices are, of course, even less standardized than those of mortgage companies. Frequently they are inclined to follow the methods of lending institutions in their communities. Since they are not handling the funds of others, however (except where they act as trustees) they have greater freedom of action than most of the institutions and are often found willing to advance a higher percentage of property value than are banks, trust companies, or insurance companies, especially where they have an opportunity to obtain an unusually favorable return.

The home-owner who finances through an institution can usually depend on being able to renew his mortgage, especially if he has decreased the loan principal by means of installment payments. There is frequently less assurance of the permanence of the loan obtained from a private in-

vestor. A change in the plans or circumstances of the lender or his death may result in an unexpected failure to renew the loan. This sometimes creates an exceedingly embarrassing situation for the home-owner in a community having limited mortgage facilities. In this connection it may be mentioned that trustees sometimes have limited power in the matter of extensions and renewals.

NATIONAL BANKS

National banks and many of the other commercial banks have not been lending on real estate to any considerable extent, partly because of restrictive federal and state laws. They have large savings resources, however, and are, therefore, a potential source of funds for home-owners. A law enacted in 1927 permits national banks to invest as much as one-half of their savings deposits in realty loans for periods up to five years, and many of them have commenced to devote a larger part of their assets to real-estate lending.

Second Group

Families having in the neighborhood of from 25 to 40 per cent of the amount needed to buy or build a home have fewer agencies to choose from than families in the group heretofore discussed. In some of the states which do not have laws restricting their lending on real estate there are savings banks willing to advance the amount required, and in some communities mortgage companies will make such loans where the borrower pays a commission or a higher rate of interest than that prevailing for more conservative loans. The building and loan association, however, is the most popular source of funds for families in this group.

BUILDING AND LOAN ASSOCIATIONS

The building and loan association[1] is an organization created for the promotion of thrift and home ownership. It accomplishes its worthy objects by providing a method of saving and by lending its funds for the purchase and construction of homes. . . . .

Various plans for obtaining funds are employed by the associations. Under the plan in most common use members subscribe for "shares" and make regular stated payments on them until the sum of these installment

[1] This is the name most widely used, but many other similar names have been adopted by the various organizations throughout the country. The following are a few examples: "Savings and loan association," "Building loan and savings association," and "Loan and building association." In Massachusetts the associations are known as co-operative banks and in Louisiana as homestead associations.

payments, added to the dividends obtained through the lending operations, equals the matured or face value of the shares. Some associations require no share subscription but accept deposits in almost any amount and at any time; others derive funds from the sale of full-paid shares or investment certificates. Frequently where their funds are insufficient to supply the demand for loans, associations borrow for the purpose at a rate lower than their own charge.

Building and loan associations usually pay a higher rate of return to their depositors than is obtainable from other savings institutions, and prospective home-owners who place their savings in the associations may often accumulate sufficient funds to make the first payment on their homes more quickly than is possible by any other method affording equal safety.

Lending policies and methods differ among the associations. Applications for loans usually are received only from members, but in many associations the home buyer may easily enter the membership and apply for a loan at once. The loan-application forms frequently call not only for data regarding the site and the existing or proposed building but also for information as to the health, occupation, and income of the prospective borrower. The element of personal responsibility is often given considerable weight, especially where the loan applied for is large and the borrower's equity in the property small. In a number of associations the application is examined by the board of directors, and if the proposition appears sound on its face the appraisal officer or committee is instructed to report on it, and title to the property is ordered examined. Appraisals are usually made by personal inspection. As in the case of savings banks and other institutions lending on real estate, the valuation reported depends somewhat on the attitude of the particular association toward the existing realty market. Many building and loan associations appraise property at the full market value and are willing to lend on the basis of two-thirds or more of their appraisements. In some cases as much as 80 per cent of a fair valuation is loaned. The monthly amortization plan[1] enables the associations to lend a very large percentage of property value and yet provide a high degree of safety for their investments. They find that these frequent payments on the loan more than offset depreciation of the property and declines in market value.

Association loans are made for periods as long as 12 years. The interest rate is often slightly higher than that asked by savings banks, trust com-

[1] See *Present Home Financing Methods*, Appendix, p. 17 for amortization tables.

panies and insurance companies, and a "premium," or commission, is sometimes charged. The associations justify these higher charges by calling attention to the fact that, as their loans are made for long periods, the borrower is saved the expense of renewals. They also feel that in making loans representing two-thirds or more of property value they perform a greater service than do institutions lending not more than half the amount of their appraisements and are, therefore, entitled to a higher return. Borrowers seeking construction loans often find it to their advantage to pay the slightly higher rate asked by building and loan associations, as most of these organizations are specialists in this type of lending and their service and advice in connection with the building project frequently save the home builder much inconvenience and expense.

Many associations require the borrower to subscribe for shares having a matured value equal to the amount of the loan. In such associations the monthly payments cover interest on the debt and installment dues on the shares. Interest is calculated on the full amount of the loan throughout its term, but the borrower is credited with dividends on the amounts applied toward his shares. When the shares are matured they are used to cancel the loan. Other associations apply the monthly amortization payments directly against the loan and charge interest on outstanding balances. The amount of interest paid by the borrower under the first arrangement is, of course, larger than that paid under the second where the dividend rate is lower than the interest rate.

SECOND MORTGAGE BORROWING

In communities having no building and loan associations and in those where the associations and other agencies are unwilling to supply on first mortgage from 60 to 75 per cent of the amount needed to acquire the home, borrowers in the second group generally find it necessary to use two loans, the first obtained from any one of the agencies previously mentioned and the second from an individual or organization advancing funds on second-mortgage security.

There are numerous private investors engaged in this kind of lending, and a large part of the business is handled by organizations called "second," or "junior," mortgage companies. In Maryland and Pennsylvania many of the building and loan associations make second-mortgage loans.

As the legal rights of the second-mortgage lender are subordinate to those of the lender on first-mortgage security, and as his risks are usually

greater, he charges more than the first-mortgage rate. The whole charge is rarely made directly, however, for the reason that the maximum rates permitted by the usury laws of most of the states are not high enough to yield a return satisfactory to the second-mortgage agency. In order to avoid violating the usury laws and yet obtain a rate which they consider adequate to compensate them for the risk they assume, second-mortgage lenders conduct a discount business, purchasing second-mortgage notes at less than their face value. As an example of the operation of this method of advancing funds, we may take the case where a note is purchased from an operative or speculative builder who has accepted it from a home buyer as part of the selling price of a property. Though the builder usually adds to his price the amount of the anticipated discount and the buyer, in effect, pays a usurious rate on the obligation transferred, the second-mortgage agency does not violate the usury law.

However, much of the demand for second-mortgage funds comes from operative builders who need the money for construction purposes and from persons building their own homes. In order to obtain the business of these two types of borrowers and yet make the transactions appear to be note purchases, a considerable number of second-mortgage lenders grant loans through a third party whom they procure to act as the lender. The borrower's note is executed in favor of this party, who indorses it to the second-mortgage agency. The latter "discounts" the note, to obtain an interest rate greater than the legal maximum, and turns the proceeds over to the borrower. This is a mere subterfuge and the transaction is tainted with usury. In those states which impose a light penalty on the usurious lender, such as the loss of interest or part of it, this practice is freely indulged in, however, and borrowers seldom attempt to take advantage of its illegal feature.

As a rule, second-mortgage loans are made on the amortization basis. Charges vary according to the locality, the demand for funds, the risk, and the length of the loan period. Interest rates are usually 1 or 2 per cent above the prevailing first-mortgage rates, where the state law permits, and discounts are quoted at from 4 to 10 per cent a year. Since the borrower is usually required to curtail the loan periodically, and therefore does not have the use of the whole amount for the entire loan period, these discount rates are actually considerably higher. In fact, under the usual regularly amortized loan the real discount rate is approximately double the advertised rate. But, expressed entirely as an interest charge, the rate paid by the borrower is even higher than the total of the combined

nominal interest rate and the actual discount rate, because "discount" differs from "interest" in that it is paid at the beginning of the loan term and not during the term or at the end of it. Thus, on a typical monthly payment three-year second-mortgage loan bearing 7 per cent nominal interest and a 15 per cent discount (5 per cent annually, so called) the rate paid by the borrower is approximately 18 per cent a year.

In many communities the high rates charged for second-mortgage funds have had a tendency to discourage home building. In some of these communities this situation has been partly overcome by chambers of commerce and other local groups.

In Gardner, Mass., a group of about 100 business men, coöperating with the local chamber of commerce, agreed to become liable to the extent of $1,000 each on second-mortgage-note indorsements of a committee which they formed. No actual cash was required of the members of this group, but by thus lending their credit they were able to obtain second-mortgage funds for home-owners from a local bank at a low rate of interest and without a discount charge. Similar plans were used in several other cities.

A second-mortgage company was formed in Providence, R. I., to provide funds for periods of 50 months at a total discount of 5 per cent, covering the whole term. This company helped to relieve the second-mortgage situation in two ways. It loaned several hundred thousand dollars at relatively low rates, and through its operations caused other local second-mortgage agencies to reduce their charges.

In some sections lumber dealers assist in solving the problem, and at the same time increase their sales, by indorsing the second-mortgage notes of home builders who purchase material from them.

Third Group

THE THIRD MORTGAGE

The home buyer able to make but a 10 or 15 per cent cash payment can sometimes obtain a second-mortgage loan large enough to bridge the gap between his initial payment and first-mortgage loan and the selling price. Where the transaction is handled by means of mortgages, however, the buyer is frequently compelled to use three loans. The seller of the property as a rule holds the third mortgage and receives no principal payments on it until the buyer has paid off the second. In order to facilitate sales, many builders accept third-mortgage notes as a part of the purchase price, but where they sell these notes they usually add an allowance for

the discount to the price of the property. In these instances the financing charges borne by the home-owner are extremely heavy, as discounts on third-mortgage notes are considerably larger than those on second-mortgage paper. Buying a home from an individual or organization unwilling or unable to hold the note and to allow the purchaser the full face value thereof is therefore not to be recommended.

THE LAND CONTRACT

Another, and a more widely used, financing plan for home buyers in the third group is founded on the land contract. This instrument is most popular in the Middle Western States. It is simply an agreement between the buyer and the seller of property under the terms of which the buyer usually makes a small down payment and agrees to pay the full purchase price in installments, frequently monthly. The seller does not immediately pass the legal ownership of the property to the buyer, but agrees to convey the title to him when a certain percentage of the purchase price, say, 50 per cent, has been paid, at which time the buyer gives a mortgage to the seller or to some third party supplying a loan for the unpaid balance.[1]

It is said in favor of the land-contract sales method that it makes home ownership possible for a large class of persons who might be unable to buy in any other way. Many real-estate operators like it for the reason that under it they retain the title until the buyer has a substantial equity, and therefore are often in a better legal position than the holder of a mortgage would be in cases where the buyer fails to live up to his agreement.

However, in many cases the land contract has disadvantages to both parties concerned. It is pointed out that the seller may legally contract to transfer title to property which he does not own when the contract is executed, expecting to acquire it prior to the time agreed for the conveyance, and that one who deals with an irresponsible seller contracting on this basis and unable to acquire the property he has agreed to convey may sustain a considerable loss. This situation has sometimes arisen in transactions involving the sale of building lots in new developments. While it is true that the purchaser may often guard against such a contingency by making sure that the seller has a good title and by recording the con-

[1] In a number of states a land contract covering the difference between the down payment and the first mortgage is often used in place of a second mortgage.

[NOTE.—Excellent amortization tables are included in the pamphlet *Present Home Financing Methods* from which the foregoing information has been taken.]

tract, it is not customary for buyers on land contract to obtain an abstract of title or a certificate of title insurance prior to the time for actual trans-

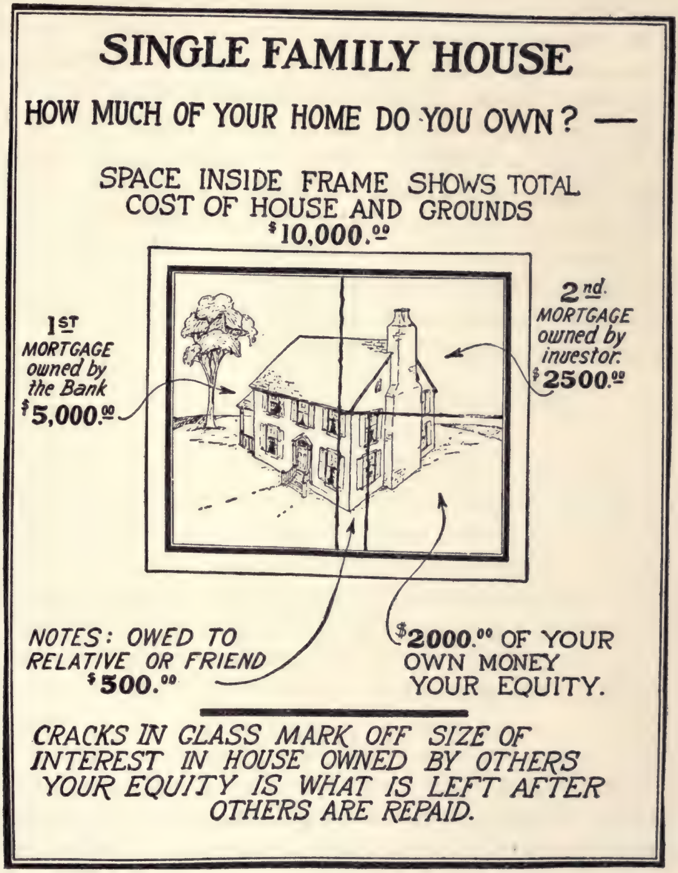

FIG. 4.—The proportion of your house that you *own* is the part you have paid for—your Equity. All the sections in this diagram except the lower right-hand corner represent the shares which others own, although the title may be in your name. (Reprinted from *Primer of Housing*. Courtesy of Arthur Holden, and Workers Education Bureau Press.)

fer of title, and in some states no provision is made for recording the contract.

Again, an unreliable seller might transfer the property to the buyer encumbered with debts much larger than the amount due under the con-

tract, and in this instance the buyer would be compelled to assume obligations not contemplated by his agreement in order to retain the property. Such losses are often prevented by placing the deed in the hands of a bank or similar institution, acting as a third party, which applies the buyer's payments properly and delivers the deed to him at the time agreed upon.

Among disadvantages to real-estate men which cause many of them not to enter into land contracts is the fact that a considerable amount of capital which they may need for other purposes is tied up in financing the purchaser. In some places real-estate operators are unable to borrow on favorable terms on the strength of their land contracts, or are unable to sell them at a satisfactory rate of discount. In some states sellers are deterred from using the method because of the complicated and lengthy legal procedure required in cases where the buyer defaults and the seller wishes to regain possession of the property.

BUILDING AND LOAN AMORTIZATION

By THOMAS M. CURRAN
U.S. Department of Commerce

Although for generations the building and loan associations of the country have been lending funds for home buying and home building on a scientific and widely known monthly repayment basis, there is considerable misinformation current as to the proportion of the monthly payment applied to interest. It is often thought that the interest portion is much larger than it actually is, and, in fact, the idea is lodged in many minds that "half the monthly payment is credited to interest and half to principal."

This impression may have been originally obtained as a result of the experience of borrowers who have dealt with organizations which have misused the building and loan name and engaged in irregular practices. Or, it may have resulted from a careless examination of published building and loan tables like Table III, showing the retirement of a $1,000 six per cent loan through monthly payments of $10 each over a period of about 139 months.

A glance at the "Payments" column and the "Interest" column, which show entries of $120 in one and $60 in the other, might easily mislead the layman into thinking that the interest is one-half the payment. Of course, those familiar with building and loan financing understand that the dividends must be subtracted from the interest—which is actually gross interest—in order to find the net interest charge, and that the "Loan Out-

TABLE III

$1,000 Loan at 6 Per Cent Payable $10 Monthly

Month	Payments	Loan Outstanding	Interest	Dividends
12	$120	$938.24	$60.00	$ 1.6615
24	120	872.92	60.00	5.4160
36	120	803.52	60.00	9.4005
48	120	729.90	60.00	13.6265
60	120	651.78	60.00	18.1110
72	120	568.92	60.00	22.8675
84	120	481.00	60.00	27.9140
96	120	387.73	60.00	33.2685
108	120	288.79	60.00	38.9480
120	120	183.81	60.00	44.9740
132	120	72.45	60.00	51.3670
139	70	4.32	35.00	33.13
140	10	−5.64	5.00	4.95
	$1,400−$5.64	....	$700.00	$305.6390

standing" column must be referred to in accounting for the disposition of the $120 yearly payments. Thus, at the end of the first year the situation is shown as follows:

Gross interest..............	$60.00	Original principal........	$1,000.00
Less dividends.............	1.66	Less loan outstanding....	938.34
Net interest...........	$58.34	Applied to principal..$	61.66

Net interest...............	$ 58.34
On principal...............	61.66
Total payments........	$120.00

The family contemplating the purchase of a home is vitally interested in knowing what part of its monthly payment is to be applied toward increasing its equity in the property. After considering taxes, repairs, and other expenses incident to home ownership, the home seeker who gets the impression that one-half, or nearly one-half, of each loan payment goes to the financing institution as interest is likely to become discouraged at the outset. Even if he has no erroneous ideas on the point, the mere conviction that the amount applied to interest becomes less and less as the months go on does not give him the same incentive to take the road toward home ownership that more exact knowledge would.

The average proportion of the monthly payment actually taken as interest may be readily derived from Tables IV and V containing figures

in use by building and loan associations throughout the country. The first is a 6 per cent table in use by associations employing the monthly

TABLE IV

$1,000 Loan at 6 Per Cent, Payable $10 Monthly

Month	Total Payments	Applied to Interest
12	$120.00	$58.36
24	120.00	54.56
36	120.00	50.55
48	120.00	46.25
60	120.00	41.71
72	120.00	36.89
84	120.00	31.76
96	120.00	26.32
108	120.00	20.52
120	120.00	14.40
132	120.00	7.89
139	70.65	1.44
	$1,390.65	$390.65

TABLE V

$1,000 Loan at 7 Per Cent, Payable $10.83 Monthly
6 Per Cent Dividends Credited Semiannually

Month	Total Payments	Applied to Interest	Dividends Credited
12	$129.96	$70.00	$ 1.66
24	129.96	70.00	5.42
36	129.96	70.00	9.40
48	129.96	70.00	13.63
60	129.96	70.00	18.11
72	129.96	70.00	22.87
84	129.96	70.00	27.91
96	129.96	70.00	33.27
108	129.96	70.00	38.95
120	129.96	70.00	44.97
132	129.96	70.00	51.37
140	75.81	46.64	38.08
	$1,505.37	$816.64	$311.28*

* Includes credit of $5.64 due borrower.

reduction plan; the second is used by those having separate savings and loan accounts and charging 7 per cent interest on the loan and crediting dividends at 6 per cent on savings. Both types of loan are repaid in about twelve years.

By dividing the total interest ($390.65) by the number of monthly payments (139) we find that the average monthly interest charge is $2.81—more like one-quarter than one-half of the monthly payment of $10.

Subtracting the dividends ($311.28) from the total of the interest column ($816.64) gives the net cost to the borrower ($505.36). Dividing this net interest cost ($505.36) by the number of monthly payments (140), we find that the average monthly interest charge is $3.61, exactly one-third of the monthly payment of $10.83.

The practical application of the results of these calculations becomes more evident when we deal with a typical undertaking. Assume a $5,000 building and loan obligation on a 6 per cent basis. The monthly payment to the association is $50, and on the average the home-owner's equity grows at the rate of $35.95 monthly. On the 7 per cent basis referred to, the monthly payment is $54.15, and the average monthly credit toward the equity is $36.10. How often do we see the advantages of amortization presented to the home seeker in this way?

[Note.—In addition to the sources from which money may be borrowed for home financing, arrangements have from time to time been made by employers to assist employees who are desirous prospective home-owners in home financing. From a survey of 430 companies made by the U.S. Department of Labor, 196 reported an effort to encourage employees in systematic saving, and many of these companies make specific arrangements for home financing. One large mail-order house sells thrift certificates, which bear 5 per cent interest, and any employee who is head of a family and who has saved $500 may borrow money from the company for the purpose of financing a home.

Other arrangements also are made similar to the following one of a particular company: Employees after three months' service are eligible to participate in a savings plan whereby they may pay into a savings fund an amount not over 10 per cent of their wages. The company pays at the end of each year one-half the amount paid by the employees. This is credited to each employee's account during a period of five years at which time the employee may withdraw his funds with 6 per cent interest. If he withdraws his money before five years he forfeits the corporation's funds of the incomplete year. At the end of the sixth year after this plan had been established about one-fifth of the employees who participated in the plan used the money for home financing.

Companies with no specified plan give advice and financial assistance in home buying. Others encourage home ownership by making specific arrangements for financing the second mortgage.

Such admirable efforts on the part of employers as those mentioned above which assist workers in financing their homes undoubtedly encourage home ownership in a greater number of families than those which have received the material help, for almost every family has a strong desire for an owned home and a few good examples in a neighborhood of attractively owned homes will encourage saving for this most worthy purpose.]

MAINTENANCE COSTS AND OTHER EXPENSES IN HOME OWNING

The actual money that is used for building or buying a home is not the only cost in home financing. Every home requires certain expenditures for repair and upkeep. In addition there are taxes, insurance, water costs, miscellaneous items and improvements to be considered.

The amount of money for maintenance varies according to the quality of materials and construction and the amount depends also upon the family's inclination to make minor repairs of the house promptly; for if small repairs are neglected they often become large ones very rapidly. No attempt, however, is made even to estimate the proportion of the cost of the house that may be allotted to maintenance. Housing specialists have suggested that in order to avoid a high maintenance cost that it is well when building to eliminate those items, if possible, which need repair frequently. If these items cannot be eliminated, it has been suggested that particular emphasis should be given to them during construction in order to eliminate as much repair as possible.

Dr. John M. Gries and James S. Taylor have discussed briefly in the following paragraphs the usual maintenance costs and such items as property taxes, special assessments, insurance, water taxes or rents, and accessories.

In addition to payments on principal and interest of loans on a home, allowance must be made for some or all of the following expenses: (*a*) Renewals and repairs, (*b*) property tax and special assessments, (*c*) insurance, (*d*) water tax or rent, (*e*) accessories, and (*f*) improvements.

In addition to the above, some home-owners add in the interest which they would otherwise receive on the amount of their cash payment or equity.

In considering annual expenses, maintenance is often neglected by those who buy new homes. The amounts spent will depend largely on the owner's ability and readiness to be his own repairman. After a few years certain parts of the house will need to be repaired or renewed. The outside sash and trim of all houses and the entire exterior of some will need repainting at intervals. This is an expense which many home-buyers do not consider when they buy.

The interior walls will need repapering or repainting every few years.

Those who purchase an old house often fail to consider whether the roof must be renewed. This may cost from $100 to $400.

There are many smaller items of expense which will be called for both in a new house and in an old house. The prospective home-owner should consider these expenses before deciding how much he can pay for the house.

The amount spent for renewals and repairs cannot be determined by any

fixed rule. Their cost depends partly on choosing the right workmen, and varies with the quality of construction, the age of the house, and the alertness of the owner in making minor repairs before more costly work is necessary.

A house that is maintained well and kept up to date with modern improvements might not decline appreciably in value over a long period of years while another might become worthless within a short period.

In the purchase of a house it is well to find out the tax rate and the assessed valuation, so that the amount of taxes to be paid each year may be estimated.

If the street is to be paved, or new water, sewer, or gas-mains, or electric light lines are to be put in, there may be special assessments charged against the property. It is well to find out which ones of these must be allowed for.

The rate of fire insurance may depend upon the materials used in building, the fire protection afforded in construction, and the location of the house, but it is rarely as much as one-half of 1 per cent of the value of the house. Insurance is necessary not only to protect the mortgage holder but also the equity of the owner. It is always required by the bank, trust company, or building association making a loan.

This tax is usually small but should be considered in estimating fixed expenses.

The purchaser of a new house usually finds that he must spend something extra to make the house comfortable. As a rule he must buy screens for all windows and some of the doors. In cold climates he frequently finds it advisable to buy storm-windows and storm-doors, or at least to install weather-stripping. Awnings, as a rule, must be purchased by the owner. Frequently $200 or more must be spent on the house before it is in satisfactory condition.

The owner is likely to make certain improvements and changes that call for expenditures. In a house of low cost many desirable features are omitted, and, as a rule, the family insists on adding some of them. It may be decided, for example, to put in partitions, if none have been installed, separating the coal-bin, the fruit-closet, and the laundry from the rest of the cellar. This may cost from $50 to $150. Other improvements often added are: Sleeping-porch, a screened-in porch, tile in the bathroom, papering other rooms, sodding the yard, and storm-windows or doors.[1]

WHEN IS HOME OWNERSHIP INADVISABLE?

Home ownership is without doubt desirable for the great majority of families. There are families, however, whose incomes will not permit them to finance their homes with safety, and families whose occupations are of so uncertain a nature that they are compelled to move frequently from place to place in order to find work. Also men and women engaged in certain occupations and professions should be left free to accept better

[1] In *How To Own Your Home*, pp. 27–28.

positions when offered them in other parts of the country. In great metropolitan centers it is often impossible to own a house conveniently near the work of the family breadwinner.

On the other hand, there are many restless-minded families who go about from city to city, from one part of the country to another, or from house to house and apartment to apartment with no particular purpose in mind. They doubtless would have been better off economically and much happier if they had taken root in a particular community and helped it to grow and prosper.

Some of the conditions which make home ownership inadvisable arc discussed briefly in the following paragraphs by Horace F. Clark and Frank A. Chase.

Whether a man is justified in building or buying depends upon many economic factors. It has frequently been said that all men are better off as home-owners, and in general this is true. There are many persons, however, who are not in a position to hold property. The mobility of our urban population in America is extraordinarily great. There is much moving around within the city. It is well known that in some cities certain days are set aside as moving days, at which time a large portion of the population vacates its former dwellings and moves to new locations. Part of this moving is entirely unnecessary, being caused by a spirit of restlessness and discontent, but a large part is due to the desire to live in a place where rents are more equitable, where the neighborhood contains a more congenial class of people, or to be nearer a business place, or (which amounts to the same thing) to be nearer better transportation to and from work. People who are renting homes have the opportunity to make such adjustments when they find their first location unsatisfactory, whereas in case of purchase it is necessary to dispose of the property perhaps at a loss, and always with the expense of sale, or to put up with unsatisfactory conditions.

The external flow of population into and out of cities is also an element in the housing situation. Men move to new locations because of changing occupations, seeking better pay or better working conditions, or perhaps because their former industry has passed its usefulness and gone out of existence.

Under what conditions should tenancy be encouraged? There are many times when a family is better off not to own realty in a location where its members are not satisfied, or where they can no longer make a living. Each case must be decided on its merits.

Examining the housing conditions of the entire United States, we find vast differences among towns. Building and loan association men may be familiar only with prosperous towns, but there are dying villages and static towns where more houses are found than there are jobs. The leaders who founded these towns failed in forecasting their future. Perhaps the only industry located in

the town has gone out of business, as in the sawmill towns of the North, and the mining towns scattered throughout many parts of the country. A considerable number of mining towns still contain houses adequate for a population of three or four thousand people or more, while scarcely as many hundred people actually live there. People continue to live in such places in the hope that they will eventually "come back" when mining conditions change.

Such a surplus of houses causes rents to be so low that ownership is not a paying investment. Money invested in houses must make a satisfactory return with assured safety, or people will not undertake house ownership. Fortunately these adverse conditions exist in only a comparatively few communities. In many others, a live town has been inadequately planned for expansion, and this acts to retard growth and unsettle values.

The true test of a housing shortage is whether or not all the people desiring homes in a given city are able to get the kind that they want at a price within their income. Vacant large houses are no index of the supply of small houses. The rent, the amount of care necessary to keep up such places, are as definite obstacles to their use as if they did not exist. Houses of the type that people can afford to pay for, and that are satisfactory to live in, are the only kind that can be considered in measuring the actual condition.[1]

HOME OWNERSHIP AND THE WAGE EARNER[2]

By WILLIAM GREEN

President of the American Federation of Labor

In depressions of the past, the building industry has often been an early help toward recovery. In 1921 construction took the lead toward an upward movement and started to advance before industrial production made its upturn. In 1924 the unchecked growth of building operations helped to keep the country from sinking lower into business depression, and the recovery came quickly

Of all branches of the building industry, by far the most important is the construction of homes and apartments. From 1923 to 1928 between 41 and 46 per cent of all building was for this purpose. And it was home building in the days of the 1921 depression that started up most rapidly and did more than any other type of building to hasten business recovery. Again in 1924 the advance in home building was the chief influence for improvement.

[1] Taken by permission from *Elements of the Modern Building and Loan Associations*, pp. 443–45, 1925. By permission of the Macmillan Co., publishers.

[2] Adapted from "Homes for Workers," *North American Review*, CCXXXI (January, 1931), 32–36.

The present home-building programme starts a new precedent. Today conditions are very different. In the years of high building activity which made up the war deficit, homes and apartments were overbuilt. That is, they were overbuilt for the groups of people who could afford new homes at the present prices. Consequently the last two years have seen a decline in home building amounting to 31 per cent in 1929, and in 1930 home building has been 46 per cent below even 1929. Instead of being the mainstay of the construction industry, home building has dropped to 23 per cent of all construction in 1930, as compared to 41 per cent and more in former years. From far and near come tales of houses standing vacant and apartments which can not be rented.

Obviously this side of the problem must be carefully considered. We are starting on a home-building programme at a time when incomes are reduced, and when there is apparently an oversupply of houses and apartments for certain groups of the population. There is another large group of people, however, who need and want new homes—the wage earners. Hundreds of thousands are living in quarters that are anything but suitable for family life. They would gladly move into a better environment if they could find houses and apartments within their means.

Here is a real need for better housing, a demand for homes which can be a mainstay to the building industry. The problem is to construct homes at reasonable prices, within the reach of working people. A home-building programme which can accomplish this will indeed bring nation-wide benefit to American citizens as well as to the building industry.

Fifteen years ago it was as expensive to buy an automobile as it is to buy a home today. Mass production was introduced and today thousands of wage earners own their cars. Can we not hope for measures which will reduce the cost of home building as the price of automobiles has been reduced? At present it is not possible for the vast majority of wage earners to own their homes, and most even have difficulty in finding modern apartments with the equipment and surroundings which will make a suitable environment for their children.

There is nothing more important in forming the character of the American people than the home where our boys and girls grow up. Home surroundings help to mold the moral fiber that is to measure up in the tests of later years, or start the physical and mental defects which later on bring downfall.

For working men and women particularly, a good home is all important. Because it can not be supplemented by clubs, travel, opportunities

for independent living, the workman's home is definitely the center of family life, the formative influence for growing children. When we consider that 80 per cent of our 122,000,000 men, women and children are in the wage-earner group, it is obvious that good homes for workers are a matter of national significance.

The large majority of our citizenry come from workingmen's homes. They are the group our industries depend on for steady and intelligent work. They must bear the strain of sustained productive labor, often under nerve-racking conditions of noise and speed and long hours. The man who can keep his nerves steady, who does not lose his precision after weeks, months, years of hard work, is the man our country wants and counts on for responsible management of his part of the nation's work.

Growing children must have the environment that builds strong bodies. Sunlight and fresh air, a safe place to play, with grass and trees if possible, cleanliness and comfort at home, with running hot water and bath—all these are necessary to build bone, muscle, nerves, and strength which will carry through in later years. Dark rooms, foul air, cramped surroundings, may be the start of lifelong physical defects. It makes all the difference whether windows look out on an inner court or into the open air; whether children play in crowded rooms or outdoors in a playground.

No less essential are the other elements of environment. Beauty, neatness, the necessary comforts and conveniences, are part of that intangible background which means so much in mental and spiritual growth and reserve. The mother of a wage-earner's family must be cook, seamstress, laundry worker, nurse, companion to children and husband, and an economist to expend the family income. She can not employ help to share her responsibility. If this busy mother of the family is to keep clean curtains at the windows, tidy rooms, spotless linen and clothing, she must have modern conveniences to help her. For the wage-earner's wife does all her own housework, and often, when wages are low, she must supplement the family income by going out to work as well. She needs hot water, electrical wiring, adequate heating in her home.

But in spite of the great need for homes for wage earners, there are many old tenements in our cities where children grow up in dark inner rooms; mill houses in many communities, which were hastily built to provide for growing industries, still have no plumbing and even no water supply, to say nothing of central heating, gas or electric light. Yet the mental and physical health upon which the future of our nation depends is conditioned by all these elements in the home environment.

When a workman chooses his home, he has many things to consider. Probably the most dominating question is: How long can I keep my job? Can a wage earner count on steady work long enough to pay instalments on a purchase if he wants to buy a home? This question lies at the root of our home-building programme to-day.

With the swift and ruthless changes in industrial employment which have followed each other continually in practically all industries in the last ten years, few workmen can be sure that they will hold their jobs even for a year from now. New machines are introduced in one factory, and 500 are laid off; a new technique develops in another, and 50 or 60 lose their jobs. These figures mount up into the hundreds of thousands as the process of technical improvement spreads from plant to plant and industry to industry.

These are not rare happenings; they are going on continually as part of the vast industrial changes we are passing through to-day. The 20,000 business failures that occurred last year have thrown thousands of wage earners out of work. A job today is a very doubtful security indeed. Even though our factories were producing 42 per cent more in 1929 than they did in 1919, 514,000 fewer wage earners were at work manufacturing these goods; 227,000 fewer were employed on the railroads transporting them, and 122,000 fewer were mining coal to furnish fuel and power. These are just a few figures to show the enormous number of workers who are losing their jobs through increasing industrial efficiency.

Seasonal changes also lay off hundreds of thousands, and many do not get their jobs back again when the next busy season comes. In 1929 in the automobile trade, 150,000 workers were laid off in the dull season. All these men lost an average of two months and many never got their jobs back. In the clothing and textile industries, the dull season meant 32,000 jobs lost for two or three months.

Some of these workers, of course, find new work in the same city, and near their homes. But a surprising number leave town and seek work elsewhere. "I'm lucky this year," said a painter the other day. "Last year I had to travel a hundred and twenty-five miles before I found a job." And thousands are less lucky and have to travel farther. A bricklayer who kept a record of his wanderings in search of work travelled one year from Pennsylvania to Norfolk, Va., then to Washington, D.C., then back to Philadelphia for a few weeks and on to Williamsport. Each time his job lasted only a few months or less. Another year found him in Indiana and Tennessee.

Unless you have been through it yourself, you have little idea of the struggle to find and keep a job. With only a small savings account to fall back on at best, the wage earner who loses his job is in dire straits, indeed. A recent study shows that it takes on the average three months to find a new job of any permanence, and during this time savings are needed for food and bare essentials. How can a man invest in buying a home under these circumstances? Payments which could not be met when they are due would only bring the loss of all invested capital. Far better to buy a car which is paid for in a year or eighteen months. At least it will be a help in getting from place to place in search of work.

Two kinds of homes at low cost are urgently needed to meet the requirements of the modern age: (1) Homes which can be purchased on easy terms, providing security for the investment involved, so that money put into them can be withdrawn without great loss. (2) Apartments and rented homes which will be equipped with modern comforts and appliances, and situated in suitable surroundings.

At present, although there are many wage earners, especially of the more skilled group, whose jobs are more secure and who would like to own their homes, it is impossible to finance the purchase without high interest rates and difficult financial arrangements.

Compare for instance buying a car and buying a home. To buy a $500 car, you pay about $200 down, and after that $25 a month. At the end of a year, the car is entirely paid for. A $1,000 car requires only $55 a month for one year, with $340 down payment. Also, you can sell your car easily if need arises or you can use it as security to borrow money.

But to buy even a $5,000 home involves many complicated problems. First you must have at least $500 in cash. Then you may secure a first mortgage for $3,000 at 6 per cent, but to raise the final $1,500 you will have to take out a second mortgage, which with discounts will cost you at least 18 per cent, and if you happen on a sharp real estate dealer, it may cost you 30 per cent. To pay off these mortgages will take at least ten years. For the first three years payments will be $69.50 a month, then $30.30 for the next seven years, exceedingly difficult for a wage earner. When you have finished payments, you will find that with the high discounts it has cost you $1,099 to borrow $4,500. In other words, you have paid $6,099 for your $5,000 home. In the mean time you will also have taxes to pay. If you build your own home you have in addition fees for title search, and all the difficulties of choosing materials and design, about which you probably know practically nothing. Add to this the fact that

once you own your own home you would probably find it difficult to sell without serious loss if you had to move. Is it any wonder that wage earners buy cars instead?

Better financing methods would eliminate much of this difficulty and expense. But no adequate programme for better homes for workers can stop with a plan providing for the purchase of homes. What millions of workers need in this country to-day is good homes to rent, either apartments or small houses. For until we succeed in stabilizing employment and until workers' living standards are higher, there will be millions who can not possibly afford to buy homes. They are the ones who suffer most from the congested living quarters of our slums today. And it is a tragic human waste that this should be so. For out of the families of many of these workmen comes some of the finest material for our future citizenship.

Slums can be redeemed. This has been proved often enough, but in most cases redeeming the slums has not meant better homes for workers. Also experimental towns for workers in suburban districts are already being tried. These homes have a little plot of ground with grass and trees and a place for children to play, safe from motor traffic. Efforts to put such homes at the disposal of workers are most praiseworthy. The problem involves both the creation of homes in the suburbs and suitable houses and apartments within the city, and the redemption of unwholesome living conditions now existing.

As we consider the home-building programme, let us not overlook the essentials but get right to the root of the problem: That of creating good homes for workers. To solve it will require the concentrated efforts of those interested in finance, construction, real estate, labor, building materials and many other groups. It has been possible to produce automobiles, radios, furniture and other articles in mass. Is it not possible to produce good homes on a scale which will make quantity consumption possible and profitable for all concerned? The construction industry depends on wage earners and small salaried workers for the rent or purchase of at least two-thirds of all homes and apartments built in the United States. If workers can afford better homes, there is no question of an increased demand.

SUMMARY

There are many advantages of home owning over that of renting. However, the United States Census Bureau reported only 45.6 per cent of

the families of the country as home-owners in 1920. One of the reasons for a low per cent home ownership is undoubtedly difficulties in financing. Since there are countless advantages to be derived from home ownership, it is probable that the great majority of families desire to own their homes. There are always, however, some families who cannot safely finance homes, and a few whose occupations and professions are such that they cannot remain in a single community sufficiently long to make ownership advisable.

Many families find the buying of a home to be the largest investment they ever make. Before buying it is well to consider the following: (1) Income—present and future, (2) the amount of money saved, (3) the amount of rent paid annually, (4) the amount the family can well afford to pay for both the home and its upkeep. If one-sixth of the income is used for rent, it may be possible to use one-fourth or more to buy and maintain a home, for the amount used may include both rent and savings. Usually it is desirable to possess free from obligation one-fifth of the value of the house and lot in cash before making the purchase.

Financing is one of the obstacles that stands in the way of home owning. Although the cost of houses has increased during the past fifteen years, the number of sources from which money may be borrowed has also increased. The smaller the amount of money on hand the fewer the sources for borrowing, the higher the interest, and the greater the risk. Homes are usually financed by (1) paying all cash, (2) paying part cash and by raising the remainder on a first or on first and second mortgages, (3) buying on the contract plan—paying a relatively small amount in cash and the remainder in monthly instalments.

The costs during ownership should be considered before ownership is decided upon. The most important of such costs are payments on the loan, interest on the loan, taxes and insurance, extra assessments, upkeep, and maintenance of the house.

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CHAPTER II

THE COST OF THE HOUSE AND METHODS OF REDUCING IT

WHAT DO HOUSES COST?

Good houses cost more than many families can afford. Although housing specialists for a number of years have been making recommendations and suggestions for the reduction of house costs, many of which have been used with some success, there are still a great number of families in this country whose incomes are not large enough to permit home ownership. The United States Census Bureau reported in 1920 only 45.6 per cent of families as home-owners. High costs and difficulty in the financing of homes undoubtedly are responsible in part for this low home ownership that is reported by the Census. Since housing specialists maintain that a safe price to pay for a house is one which is not over two or two and one-half times the annual income it is obvious that families receiving much less than $1,500 annually cannot afford a home that will include the necessary standards for healthful and comfortable living, unless it is in the southern states where building due to climatic conditions may be less expensive. Better standards for more of the cheaper homes are now demanded, for no family should be subjected to poor ventilation, lack of sunlight, congestion, and unsanitary conditions generally. With costs as they now are families of low-income groups must necessarily live in the cast-off houses of families with more money. The problem in housing, then, is the problem of reducing costs and at the same time maintaining an acceptable standard. Every house that is erected should be planned and built with every consideration in mind for the health and comfort of the family that is to occupy it. Although the family for whom the house is built may afford a new home within a few years, the cast-off house doubtless will become the home of some less prosperous and less fortunate family.

There are a number of methods which have been both tried and suggested by which costs may be reduced to some extent. Some of these are mass production, the use of more factory-made parts, less expensive land, less expensive improvements (sewerage facilities, water, electricity, gas, improved streets and pavements), elimination of waste in all construction

processes and in materials, better use of materials, standardization of building materials and parts that make up the completed house, substitutes for costly materials, year-round construction, cheaper financing, reduction of the cost of selling, reduction of fire losses, uniformity of building codes, and eliminations in planning and building the actual house such as omitting the basement, fireplace, certain built-in equipment, etc. (Some of these methods are discussed in the following pages of this chapter; references to others are included in the Bibliography.)

Little effort has been made to determine costs of dwelling houses for the entire country, owing to the fact that costs of both materials and labor differ widely in various sections. It has been stated that the cost of a particular Colonial house built from as nearly identical materials as possible varied as much as 35 per cent in different communities, owing largely to varying material and labor costs and also to the varying profits demanded by contractors. It is difficult also to compare a particular house built in several places, as the requirements of owners will differ and the grades of materials selected will not be identical.

Undoubtedly the most extensive compilations of costs of houses are those prepared by the United States Bureau of Labor Statistics. This Bureau collects information on the cost of residential as well as non-residential buildings, the number of families provided for, and the average cost of dwellings—single, two-family, and multi-family. These cost figures, collected monthly by the Bureau, are based on costs submitted with building permits.

Table VI, adapted from one which appeared in the April, 1931, *Monthly Labor Review*, shows the average cost of dwellings, the index numbers of cost of dwellings per family from 1921 to 1929, based on the building permits of 257 identical cities in the United States.

The costs of houses reported to the Bureau of Labor Statistics are those costs stated by the builder who applies to the local authorities for a permit. Frequently there is some difference between the cost stated in the permit and the actual cost of the building. However, these figures show admirably, trends—the increase or decrease in cost over a period of years. The Bureau, however, has not distributed costs per room or taken into consideration the kinds of materials used such as brick, stucco, or wood, etc. The table shows average costs of dwellings of every size and every material.

This same Bureau has made another most interesting and useful study on the distribution of the building dollar and the relative cost of materials

and labor in residential buildings. This study which is reported in some detail in the *Monthly Labor Review* of January, 1929, has been based on

TABLE VI

Year	Average Cost of New Dwellings per Family		Index Numbers of Cost of Dwellings per Family	
	One-Family Dwellings	Two-Family Dwellings	One-Family Dwellings	Two-Family Dwellings
1921	$3,972	$3,762	100.0	100.0
1922	4,134	3,801	104.1	101.0
1923	4,203	4,159	105.8	110.6
1924	4,317	4,336	108.7	115.3
1925	4,618	4,421	116.3	117.5
1926	4,725	4,480	119.0	119.1
1927	4,830	4,368	121.6	116.1
1928	4,937	4,064	124.3	108.0
1929	4,915	4,020	123.7	106.9
1930	4,993	3,924	125.7	104.3

reports on residential building in three cities representing different types of urban communities—Cincinnati, Ohio; Decatur, Illinois; and Washington, D.C. The per cents used in Table VII are based on the average

TABLE VII

Class of Work	Total	
	Material	Labor
	(Per Cent)	(Per Cent)
Excavating and grading	4.3	95.7
Brick work	53.2	46.8
Carpenter work (builders' hardware, lumber, and mill work)	56.5	43.5
Tile work	55.2	44.8
Concrete work	51.9	48.1
Electric wiring and fixtures	65.5	34.5
Plumbing	64.8	35.2
Heating	72.2	27.8
Painting	33.4	66.6
Papering	26.6	73.4
Plastering	38.3	61.7
Roofing	54.8	45.2
Miscellaneous	74.8	25.2

costs reported by these three cities. Overhead expenses, finance charges, profits, and cost of land are not included. The Bureau also has distributed the cost, combining both material and labor among the various classes of

work that are essential in house building. Building materials represented 54 per cent of the dollar for residential building and labor 46 per cent.

The cost also has been distributed among the various classes of work combining materials and labor in these same three cities and here is where the building dollar goes (cf. Table VIII).

The United States Department of Commerce publishes in its monthly publication, the *Survey of Current Business*, construction costs and build-

TABLE VIII

Class of Work	Per Cent of Total Cost Chargeable to Specified Class of Work
	Total
Excavating and grading	2.0
Brick work	16.1
Carpenter work	32.7
Tile work	2.1
Concrete work	9.5
Electric wiring and fixtures	2.8
Heating	5.5
Plumbing	9.3
Plastering and lathing	8.6
Painting	4.4
Papering	.9
Roofing	2.2
Miscellaneous	4.0
Total	100.0

ing material prices for frame and brick houses. The figures included in Table IX appear in the February and August, 1930, and the February, 1931, issues.

The table below shows building material price indexes representing the relative cost of building materials entering into the construction of a 6-room frame house and a 6-room brick house, from the United States Department of Commerce, Bureau of Standards, Division of Building and Housing and Bureau of Census, based on prices paid for material by contractors in some 60 cities of the United States. The prices are weighted by the relative importance of each commodity in the construction of a 6-room house.

Another distribution of the building dollar has been made of the cost of nine houses averaging $15,000 by the Copper and Brass Research Association. This distribution includes landscaping, builder's profit, architect's fee, and financing (cf. Table X).[1]

[1] From *A Real Home—Suggestions to Home Builders*. New York: Copper and Brass Research Association, 1927.

Some effort has been made also to determine costs per cubic foot. Table XI shows the average costs of houses of the Pittsburgh District.[1]

TABLE IX

Year and Month	Building Material Prices (1st of Month)	
	Frame House	Brick House
	Relative to 1913	
1913	100	100
1922 (monthly av.)	182	186
1923 (monthly av.)	207	209
1924 (monthly av.)	201	203
1925 (monthly av.)	196	197
1926 (monthly av.)	195	195
1927 (monthly av.)	187	188
1928 (monthly av.)	178	183
1929 (monthly av.)	177	182
1930 (Jan.)	178	182
1931 (Jan.)	163	170

TABLE X

	Cents Spent	Total in a $15,000 House
For excavating and grading	1.8	$ 270
For masonry	9.4	1,410
For stucco, plaster and tile work	10.6	1,590
For carpentry	27.2	4,080
For roofing	5.4	810
For flashings, downspouts and gutters	0.7	105
For plumbing	9.3	1,395
For heating	7.0	1,050
For electric wiring and fixtures	2.7	405
For hardware	2.0	300
For painting and glazing	4.5	675
For screens	0.9	135
Total for construction	81.5	$12,225
For landscaping	3.0	450
For builder's profit	9.4	1,410
For architect's fee	4.5	675
For financing	1.6	240
Total	100.0	$15,000

[1] From the *Pittsburgh Realtor*, April 17, 1928. Although there are many controversies over the value of cubic-foot costs as a guide in estimating the cost of new houses, many

The tables and compilations are merely indicative of the general average of house costs, costs of materials and labor, of operations, and costs per cubic foot. As before stated, costs vary so greatly between city and city and district and district that only the most general information is obtainable.

TABLE XI

	Per Cu. Ft. 1926–27 Cents
Ordinary frame, 4, 5 to 6 rooms, bath, hot-air heat	27–32
Frame—good construction, bath, laundry, hot-air heat, yellow pine floors	32–37
Special—frame dwellings, all conveniences, hot-water heat, hardwood floors	40–50
Class C type:	
Small brick veneer, 5 to 6 rooms, bath, hot-air heat, hardwood on first floor	33–38
Class B type:	
Brick veneer, 6 to 8 rooms, all conveniences, hot-water heat, hardwood first floor	42–47
Class A type:	
Brick, tile backing, all conveniences, hardwood finish	55–65

[Note.—In addition to the information on costs of houses compiled by the Bureau of Labor Statistics, the Bureau also compiles wholesale price indexes for building materials and information on union wage rates in the building industry. Information may be obtained also from the U.S. Department of Commerce on retail prices of building materials.]

REDUCING THE COST OF HOUSES

Many suggestions have been made for reducing the cost of houses—some of these have been actually tried out. The most important of the suggested methods are mentioned on pages 51–52 of this chapter. Undoubt-

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architects depend upon this method. C. Stanley Taylor states in his article "Developing Sketch Plans for Small Houses To Meet Budget Requirements," *Architectural Forum*, July, 1928: "In the New York district, which is probably the highest priced area in the country for home building many offices have found that they never exceed sixty cents per cubic foot for quality development of small houses embodying sound construction systems and high grade materials in all details. Other offices frequently build within a fifty cent limit, and occasionally some of the very best designers succeed in designing houses that actually cost from forty to forty-five cents. The difference of a few cents per cubic foot even in a small house rapidly amounts into dollars; . . . ."

edly, the most effective work that has been accomplished in reduction of cost is the campaign conducted by the United States Department of Commerce on the elimination of waste. Standardization and simplification of building materials—that is, the production and distribution of fewer varieties and sizes of materials—have eliminated waste and reduced cost.[1] Many scientific investigations have been made, and extensive research has been conducted on both the manufacture and the use of materials. Series of tests of brick and other types of masonry, tests of cement and concrete, on the weathering of building stone, and other investigations have been made that will not only result in better built but more economically-built homes.

One of the aims of the Division of Building and Housing of the Department of Commerce is to encourage better and more economic construction. This Division also has carried on studies in home financing, particularly those financing problems involving extra charges for money—bonuses and commissions—which frequently make home owning out of the question. It also has assisted in preparing recommendations for minimum requirements for building codes. In certain cities unnecessary requirements are often made for building which result in a waste of both material and labor. The Building Code Committee of the United States Department of Commerce has made every effort to determine types and quality of building material and construction that are safe and sound and also economical. By the use of the requirements drawn up by this Committee much waste may be prevented, for each year a number of communities adopt new building codes and in others old codes are revised. A similar Committee on Plumbing has also drawn up minimum requirements. Experiments conducted continuing over several years were necessary to determine the best principles of design for plumbing systems.

Another method of eliminating waste and thus reducing cost is by distributing more evenly building activity throughout the entire year. In past years a large part of the building has been done during a period of four or five months. This seasonal work results in unemployment among workers during a part of the year, and it also affects the manufacturing

[1] The number of sizes of building materials has been greatly reduced. The percentages of reduction in 1928 were as follows: Vitrified brick, 66 to 5; metal lath, 125 to 24; rough and smooth face brick, 75 to 2; common brick, 44 to 1; hollow building tile, 36 to 20; concrete building units, 115 to 14 (see Ray M. Hudson, "Simplified Practice Achievements in the Building and Construction Field," *Architectural Forum*, October, 1928).

plants where building materials are produced. Mr. Hoover states in his Foreword to *Seasonal Operations in the Construction Industries:*

Activity in construction bears a close relation to general industrial conditions. The construction and equipment of new buildings result not only in the employment of building trades labor but in production of lumber, cement, iron and steel products, brick, sand and gravel, lime, hardware, paint, electrical equipment, furniture, textiles, and a variety of other materials. If building falls off, there is bound to be slackening in many other lines of industry, resulting in unemployment, decreased purchasing power of employees, and further depression. The ebb and flow in the demand for construction, seasonally and between different years, thus to a large degree affect our economic stability.

The need to eliminate the wastes of seasonal idleness has been brought forcibly to the attention of the construction industries and the public by reason of high labor costs and the failure of the building trades to attract young men into their ranks. Lengthening the building season will mean greater production from the men now engaged in the building trades and will also go far to attract capable apprentices.

The use of short-length lumber whenever possible in the building of homes is also an important factor in building economy. The National Committee on Wood Utilization has outlined this economy in the following paragraphs:

Hundreds of thousands of small homes and farm structures are being built in the United States every year, and wherever in their construction long lengths of lumber are used when short lengths would serve the purpose just as well the result is waste. The custom of demanding long lengths originated in the days when the need for husbanding our forest products was less apparent than it is to-day. But those times have passed, and with them must go the extravagant habits unlimited supply created, for this wasteful practice is putting a drain on our forests that, unless stopped, will eventually tend to raise the price of long-length lumber and, so, to increase construction costs to all builders.

"Short-length lumber" is that which is less than 8 feet long. Pieces of 6 and 7 feet form part of the standard output of practically every saw and planing mill; lengths of 4 and 5 feet are less frequently regarded as a salable portion of the mill output; lengths of 2 and 3 feet are discarded except by those lumber manufacturers who handle the more valuable species of wood or who have worked up specialized markets for these pieces; yet all of this material is of high intrinsic value as respects quality and accuracy of manufacture, is admirably suited to many uses, and under present market conditions is economical. Notwithstanding which, lengths less than 8 feet seldom are specified in standard commercial practice.

The production of short lengths in saw and planing mills is as inevitable as the production of sawdust, shavings, or bark. In the expansion of the demand for this short lumber—often the finest clear wood in the log—lies economy for the logger, the millman, and the consumer.

To the consumer the use of short lengths would mean an appreciable saving, since it is the general practice of mills throughout the United States to quote short lengths 15 to 35 per cent below the prices asked for standard lengths of equal grade.

The industries of the United States manufacturing wood articles now absorb about one-tenth of the present short-length lumber output of the mills. They could without difficulty absorb five times as much; that is, 50 per cent of the present short-length output. This would, however, still leave 50 per cent of the present unavoidable production and all of the potential mill production of short lengths for consumption in other avenues; and outlets for it lie chiefly in the building and construction industries, inasmuch as they consume over two-thirds of all softwood lumber sawn in the United States. In expansion of the demand for short-length lumber for construction work, then, lies the solution of the short-length marketing problem.

Every year $2,000,000,000 is invested in small houses and farm buildings in the United States. Employment of short-length lumber in these structures would mean a saving to the small-home owners and farmers of tens of millions of dollars annually. This is not guesswork; the survey on which this report is based demonstrated its truth in actual computations, and the tables in which these computations are summarized put the actual dollars-and-cents savings squarely before the prospective home-owner through pointing out definite instances where the use of short-length lumber is feasible.[1]

ELIMINATION OF WASTE IN HOME BUILDING AND HOME FINANCING[2]

By ARTHUR E. WOOD
University of Michigan

There are large wastes in the building industry which could be eliminated by more efficient organization. The report of the committee on waste of the Federated Engineering Societies rated the building industry as second highest in a group of six large industries as regards the prevalence of wasteful methods. Sixty-five per cent of the waste in this industry was attributed by the committee to management, twenty-one per cent to

[1] Adapted from *The Marketing of Short-Length Lumber—First Report of the Construction Subcommittee of the National Committee on Wood Utilization* (U.S. Department of Commerce, 1926), pp. 1–4.

[2] Adapted from *Community Problems* (New York: Century Co., 1928), pp. 122–28.

labor, and fourteen per cent to other sources.[1] The wastes of management are largely due to unemployment prevailing in the industry, a considerable part of which could be eliminated. . . . .

In a foreword to a report on "Seasonal Operation in the Construction Industries,"[2] submitted by a comittee of President Harding's Conference on Unemployment, Secretary Hoover wrote as follows:

> In summary, the committee has well demonstrated the most important fact that the seasonal character of the construction industries is to a considerable extent a matter of custom and habit, not of climatic necessity. It gives recommendations of practical methods of solution through specified coöperative action of the trades and professions vitally interested in each locality—architects, engineers, bankers, contractors, building material dealers and producers, real estate men, and building trades labor. No solution is sought or suggested of government regulation. The service of the committee has been to determine the facts and to point a remedy that is consonant with our national conceptions of individual and community initiative. The need is the development of local consideration by these bodies of the problems in each community, with voluntary action to uproot wasteful customs and habits. The service to be rendered to our whole economic life by the elimination of these gigantic wastes and the conscious planning to overcome these irregularities, the improved condition of labor which is possible not only in actual construction but in the material manufacturing industries, the lowered costs of production and of building which could result therefrom, are great warranty for such coöperation.[3]

A second consideration relative to the reduction of housing costs has to do with the enlargement of credit facilities. . . . . Capital flows more freely to more profitable enterprises, such as the production of automobiles and other luxuries. To meet this difficulty following the War, bills were introduced into Congress authorizing the establishment of home loan banks, analogous to the Federal farm loan banks; and also to allow the savings and time deposits of national banks to be used for long-time loans for home building. Without such legislation it is probable that the savings banks in local communities could further home building more than they sometimes do by diverting a larger part of their loans to this end; and wherever law or custom interferes with this, the law or custom should be changed. The availability of capital for this purpose naturally affects the interest rate, which may be burdensome. . . . .

[1] U.S. Bureau of Labor Statistics, *Monthly Labor Review*, September, 1921, p. 13.

[2] U.S. Department of Commerce, "Elimination of Waste Series." Washington: Government Printing Office, 1924.

[3] *Seasonal Operation in the Construction Industries*, pp. vii–viii.

One aspect of the matter concerns the usurious charges for second mortgages. A recent survey of this matter covering practices in over 200 cities showed that not only is second mortgage money hard to obtain, but that a high bonus or discount is required for getting it.[1] Rates, including bonus, interest, and discount run from ten to twenty-five per cent on the original loan. It is alleged, of course, that these high rates are necessitated by the risks involved in such loans. But the amount of risk is probably overemphasized. At any rate, it is natural that the money lender should make the most of it. . . . . Mr. Samuel N. Reep, chairman of the second mortgage section of the National Association of Real Estate Boards, was quoted as follows on the question of usurious interest rates:

> Legislation is badly needed in many states to provide a usury law with teeth. In several states the law fixes the usury rate, then, as a penalty for violation, provides that the violator must forfeit any amount in excess of the maximum rate. The result is that operators charge almost anything, and when they are checked up and convicted simply return the excess amount. Needless to say, they are seldom brought to task. . . . . There is no question but that the high rate scares out many a family anxious to build and own their own home. I see examples of it daily.[2]

Large-scale production and the adoption of standard plans for varying types of houses by employers and by commerical or philanthropic real estate corporations should effect savings in home building. A wealth of information is available here as a result of the work of the United States Housing Corporation, and of the more recent efforts of some employers. Also, important contributions toward the simplification and standardization of construction materials have been made by the Division of Building and Housing in the United States Department of Commerce.[3]

The improvement of building codes looking toward a greater degree of uniformity as between cities regarding construction materials and measurements would reduce to a considerable extent the expense of building. A case in point is the prohibition by many communities of the use of hollow tile as a substitute for brick. Safety requirements are often too drastic, and express a lack of confidence of the people in the integrity and wisdom of the builders. Again in this connection, the work of the Divi-

[1] From material gathered and published by the *Christian Science Monitor* in June, 1925, and quoted in the *Information Service*, a publication of the Federal Council of Churches of Christ in America, June 13, 1925.

[2] Quoted in *Information Service*, June 13, 1925.

[3] See *Construction and Construction Materials*. Washington: Government Printing Office, 1924.

sion of Building and Housing of the United States Department of Commerce has been most useful. It has drawn up a model building code, and aims to secure its adoption by cities and towns.

A fundamental consideration in regard to housing costs has to do with the policy of land control. People may build "castles in the air," but their houses are of necessity set on the ground. It is the speculative element in the cost of land that retards housing developments, and all but wrecked the elaborate housing plans of Great Britain after the War. Various methods exist by which cities are learning to exercise some degree of control over land values, tending toward their stabilization. But aside from the special features of city planning, such as excess condemnation and zoning, the movement to lessen the burden of taxation upon improvements, and to shift it progressively to land, is gaining some headway. . . . .

Finally, it is clear that housing costs are much affected by Federal policies in regard to the tariff on building materials, and in regard to transportation rates and priority determinations relative to building materials. Also, the expenses of the house-owner for fuel, light, and other services are determined in part by the public attitude toward utility companies which furnish these services. . . . .

REDUCING THE COST OF THE HOUSE BY THE USE OF FACTORY-MADE PARTS[1]

By W. H. HAM
Bridgeport Housing Association

As an engineer who has spent thirty years studying building, and who has passed through the various stages of thought as applied to the workman's home, I have come to a conclusion which will strike the old builder as heresy and the investor as visionary. But I am confident that it is entirely practical, startlingly economical, and sound business, to establish a manufacturing process whereby large, complete members of a house can be fabricated in the shop, and very largely with machines. These large parts could be transported by automobile truck and erected with derricks, secured together by means of substantial anchors and bolts, so as to furnish a house of greater strength and durability than the present type of frame house. When these fabricated parts are assembled, the exterior can be treated to a normal coating of veneer which will make of it a permanent house—brick, stone, stucco; or shingles, clapboards, or sheathing.

Ample plants are available for the purpose, requiring only a small

[1] Adapted from "Factory-made Homes," *Survey*, February 15, 1929.

amount of alteration, and little if any machinery to be specially designed. I believe we are ready to fabricate a house without having to wait for the tedious process of inventing machinery or developing new materials to be used in this revolutionary process. I want to describe in some detail the process which I recommend.

The first thing about a home is a hole in the ground. I believe we are building four times too much cellar for our houses. I should recommend a cellar under 25 per cent of the house and no cellar under the remainder. But regardless of the size of the cellar, the foundation walls should be built of materials fabricated at a shop. They should be hollow, large-size shells, presumably made of concrete materials. They should be transported by truck and erected with derricks without re-handling. These shells should be filled with gross materials from the cellar excavation, so as to give the foundation wall weight and frost-proofing in our northern climates.

Revolution number two in my plan is to build the chimney in a single piece, transport it by truck, and erect it with a derrick just as we do with a large concrete telephone pole.

Next comes the house above the foundations. In the simple house, the rooms all have six rectangular surfaces: Four sidewalls, ceiling, and floor. The first element needed for a room is a floor, with the cellar ceiling, and I am confident that our engineers are competent to build this in a shop, full room-size for the smaller house, all finished, using the materials we know, want, and have used for years. This unit can be transported without interference with traffic, and pass under most of our bridges without difficulty.

Assume, then, that we have three or four rooms on the first floor, and that we shall make an equal number of units in the factory, entirely completed, transport them, lay them on their foundation, and secure them to their foundation by proper fastening on all edges.

Next come the side walls of the rooms, divided into two classes. Assume that we will be generous with sizes, building a workman's home with one room twenty-four feet long. This, I think from my experience, is excessive, but assume that we have a piece of finished material comprising an interior partition, twenty-four feet long, substantially eight feet high, and six inches thick. This finished member of the building will weigh about one thousand pounds. It will probably have one door, perhaps two, through the partition. I have no doubt that our engineers would be entirely competent to design the framing for such a partition,

and a finished surface over the frame, making it sufficiently rigid to meet all requirements of transportation, handling by derrick, and fastening together at top, bottom, and both ends, with other members likewise fabricated. This partition member should be made entirely finished, including the door with its trim and hardware, electric-light wiring, heating and ventilating ducts, and surface paint, using materials that are available in large quantities at moderate prices in the current market. Assume that such a partition, very much smaller than the wing of an airplane, is completed, and we ship it in the same way as we ship a large table for a club, or an airplane wing, and handle it with a derrick of the right size and kind, erect it in its proper position on the floor already laid, and bolt it to other units sufficiently to provide for all stresses. We then have a finished interior partition standing on a floor.

Let us assume an outer wall built in a factory and handled in much the same way, except that the exterior surface is treated with a waterproof material, ready to receive its veneer of brick, stucco, stone, or wood. This partition, with its windows already installed, will be finished with shutters on the outside, hung on proper hardware and closed for protection of the glass, shade and screen on the inside, and protected with a panel, used for the protection of windows, marked "return to the factory." All windows, as well as doors, will have weather strips.

To continue with our house. Somewhere, either in the cellar or on the first floor, we must establish a heating unit. This, in my opinion, in the future will be developed in a systematized, standardized, grouped unit, suitable for the number of rooms to be heated, any one of which may be heated to any temperature within the range required for comfortable living conditions by simply pressing a button. I think, for the workingman's home, we will burn oil in a proper heating apparatus, and heat with warmed air recirculating and under control for each room.

And now let us dare to be really radical. Let us build a bathroom, including its finished interior walls, its fixtures set in place, tested and so designed that we can hang it up like a bird-cage on a hook. That is to say, we would take a structure substantially like an elevator cage and put bathroom fixtures in it, all piped and ready for three connections, a soil pipe (three inches in diameter only, rather than the four inches we are now using), a hot-water pipe, and a cold-water pipe. Let us set this bathroom on a prepared foundation which is part of the four partitions coming together under or directly on a floor as the case may be. The bathroom

will have one outside wall ready to be finished like the other outside walls —three inside walls or partitions, and usually one door.

Stairs are now very largely made in the shop. Closets, like so many coffins, in the future will surely be made entirely finished. The second story will be finished as the first.

Then comes the roof. I have no doubt that the house of the future will have an insulated exterior wall and an insulated roof. I believe the roof can be made in large-size members, properly designed and waterproofed at a factory, these being transported by truck and erected by derrick.

Now our house is completed. But I want to make it clear that I eliminate from my program any standardization which spoils the art of the structure. I want to emphasize the fact that I do not believe in the success of stereotyped houses for workmen. We have never standardized the family. We must have a variable home as to size, number of rooms, and a variety of other elements. I am entirely in sympathy with the architect's desire to stamp his work with his personal touch, and I am firmly committed to the handling of the program in such a way that he will be given opportunity to stamp these homes with his masterful stroke of design and add those details which will give charm to these simple, home-like cottages. No two bridges are alike, but all bridges are fabricated. No two elevators need be alike, but all elevators are fabricated. Increasingly, fabrication is taking place in the building business. Eventually the small individual house, and a great number of grouped cottages in the form of a city village (like those which have been built in Bridgeport), will be processed through the manufacturing plant, with striking similarity to the development of the Ford car.

The engineer, who has proceeded by leaps and bounds in this industrial age, bringing about again and again a better product at a cheaper price, must play his part in this program, just as he has in the manufacture of the automobile.

As a result of such fabrication, I am confident the price of these houses will be reduced more than 35 per cent. When this is accomplished, it will then be possible for low-paid wage earners to live in proper homes. Slum conditions in the small city will then be eliminated. A proper home in the suburbs of our metropolitan areas will be available and a mortal blow will be struck at the slum tenements in the congested areas of large cities.

REDUCING COSTS BY STANDARDIZATION OF PARTS[1]

By ERNEST FLAGG
Architect

The standardization of all parts which go to make up the completed house, so that the different kinds may be interchangeable among themselves, is a very important element of economy in building. . . . .

The standardization of parts is a very different thing from the standardization of plans. By standardization of plans is here meant the use of the same design for a number of houses. Standardization makes for speed, convenience, and economy; but standardization of plans also produces monotony. Except under certain conditions, referred to later, the duplication of houses, which all look as if they came out of the same mold, is a thing to be avoided. It seems to indicate either woful poverty of invention on the part of the builder or a lack of interest in anything but the commercial side of his undertaking. Houses made in that way have no individuality and are reduced to the status of the manufactured article, turned out by machinery. Many attempts have been made to standardize houses and even to have molds in which they could be cast by the dozen or hundred, as occasion might require; but it is hard to think that taste can sink so low as to make that method popular. No matter how good the design may be, the continued repetition of it is deadly. To build in that way is like attempting to make a poem with but a single couplet. The couplet might be good, but the continued repetition of it would hardly be satisfying.

Standardization of the various parts which enter into the construction of houses, on the other hand, is a different matter; to do that does not lead to monotony, but to simplicity and repose. Just as one can make an indefinite variety of words by using the same twenty-six letters, so one can make an indefinite variety of houses, using standardized parts. Doors, windows, moldings, columns, beams, rafters, stairs, dressers, and all the other things that enter into the composition may be of uniform sizes and patterns, but combined in an indefinite variety of ways, and the same is true of building methods and processes. If a number of houses are to be built at the same time, it is much more economical and convenient to buy the things needed, or make them, in large quantities and use them interchangeably, than to make them up piecemeal after a variety of patterns. And even if there is but a single house to build, a considerable saving may be had by making similar parts uniform.

[1] Adapted from *Small Houses* (New York: Charles Scribner's Sons, 1922), p. 92.

When parts are to be standardized, one can well afford to devote more time and care to their design than otherwise; in that case it pays to take great pains to eliminate waste which otherwise would be many times multiplied. When the parts of a house have been properly standardized, every feature will have been so designed and adjusted as to call for the use of stock sizes of materials, without cutting or waste. The sashes, for instance, will be arranged to receive panes of glass of commerical sizes, walls will be spaced to permit of the use of standard lengths of lumber, and so on. To do this will result not only in saving materials but time also, which, in these days of high wages, is quite as important.

The standardizing, if properly done, will be applied to every detail of the building no matter how small, and on every one something should be saved. All these little economies, which though they may seem trifling when considered separately, will amount to a great deal in the aggregate. Moreover, this careful study of the parts saves trouble in erection, and in many ways expedites, simplifies, and improves the work.

OTHER OPINIONS ON REDUCING THE COST OF HOUSES[1]

Most of the effort thus far made towards reducing the cost of houses has taken the direction of seeking to reduce the cost of the shell of the house—as distinguished from the things that go into the house.

While the cost of the shell, or the building itself, is still the major part of the cost of a house, the other elements that enter into this total cost are quite substantial ones. According to Henry Wright the cost of the shell of the ordinary house may be taken as from 45 per cent to 60 per cent of the total cost. Moreover, according to Ernest P. Goodrich, President of the Research Institute for Economic Housing, the cost of the house itself is but 50 per cent of the total cost of a home—the remaining cost being distributed as follows, 10 per cent for the land, 25 per cent for the municipal improvements such as sewers, water, grading, gas, electricity, streets and pavements, and 15 per cent for the cost of financing.

Lewis Mumford, who always writes in interesting fashion, in an article in the *Architectural Record*,[2] a few months ago, discussing this question of "Mass Production and the Modern House," points out that "the two new

[1] Adapted from "Should Building Costs Be Reduced?" and "High Cost the Chief Obstacle in Home Ownership," *Housing*, December, 1930, published by National Housing Association.

[2] January and February, 1930.

spots where mass production would take the place of present methods, namely, in the shell itself, and in the assemblage of the parts, offer only a minor field for reductions." As he says: "To cut the cost of the shell in half is to lower the cost of the house a bare 10 per cent." He rightly adds: "A good part of the total cost of housing is represented by factors which, like the cost of money or land, are outside the province of factory production; or, like the numberless constituent parts of the house, are already cheapened by mass production."

On the economic side of the problem and the important factor that a man who has not sufficient earning capacity cannot afford to buy the best home to live in, any more than he can buy the best of anything else, Mr. Mumford says:

> Plainly, the architect cannot solve by any magical incantations the problem of supplying new houses to families whose income is not sufficient to cover the annual charges. There is no answer to that question except . . . . in the form of higher wages or state subsidy; although a wilful blindness to this fact is almost enough to establish a person as a housing authority in the United States.

Summing up the possibilities of mass production as a means of reducing the cost of houses and bringing them within the purchasing power of the lower income group, Mr. Mumford says:

> The new houses might well be better than the present ones—they could scarcely be worse. But if better, they would not be radically cheaper; and since a new cost, a cost that is excessive in the motor industry, namely, competitive salesmanship, would be introduced, the final results promise nothing for the solution of our real housing problem—the housing of the lower half of our income group, particularly of our unskilled workers. The manufactured house no more faces this problem than the semi-manufactured house that we know to-day.

May it not be that what makes the high cost of living today is the cost of high living, as pointed out by the late James J. Hill some years ago. More and more the people of this country are demanding luxurious ways of living. It has been often said that the laborer in America to-day enjoys luxuries and comforts that kings and princes did not know a few centuries ago, and the emphasis seems to be increasingly in this direction.

How many people who are about to buy a home consider first the question of its sanitation? How many ask about its light and assure themselves that every room is afforded an abundance not only of light but of sunshine? How many assure themselves that that light and sunshine is a permanent possession and cannot be shut off by some other building that may be put on the next lot? How many home purchasers consider or con-

cern themselves with whether their homes have cross ventilation in every room, thus assuring to them moving air—one of the most important elements in maintaining a healthful atmosphere in their homes? How many home purchasers or home builders know anything about or care anything about the extent to which the home is soundly constructed?

The things that catch the eye, the things that other people are having, the black-tiled bathroom, the electric refrigeration, the new types of equipment in dining room and pantry and elsewhere—these are the things that the average home buyer and home builder thinks about and on which he—or rather she— places emphasis. . . . .

A New York builder of large experience in the building field, G. Richard Davis, recently called attention to this factor in the rising cost of construction.

Mr. Davis said recently:

The demands made by tenants have greatly increased. In the average apartment house, for instance, room sizes are constantly changing, with a very strong demand for larger living and bedrooms and for smaller dining rooms and kitchens. Living conditions have been changed since the great war.

The kitchenette is a product of necessity. We are adapting ourselves to smaller kitchens and compact equipment. The electric ice machine is now asked for in even the most modest priced apartments. Garbage incineration, soundproofing partitions and floors, radio outlets, lighting switches and base plugs, laundry and storage facilities, open fireplaces, enclosed radiators, showers, chromium plated bathroom fittings, brass pipe, two-pipe modulated heating systems, are all additions to the requirements of the average tenants of today, as compared to twenty years ago.

These additions, improvements and betterments have all added to the cost of building construction, and when one estimates the increased cost of a building today as compared with two decades ago this must be taken into consideration.

That what goes into the building has much to do with its cost was strikingly illustrated by an article in one of the architectural journals a few months ago. That article described two very charming and attractive high class residences that had been built, one on Long Island, the other a few miles away in Westchester County. The house plans were practically the same, almost identical. The houses were equally attractive in appearance, both were by the same firm of architects. But the house on Long Island cost only $40,000 to build, whereas the house in Westchester cost $70,000, and they were built within a few months of each other.

The architect gives a detailed analysis in contrasting columns of the

reasons for this difference in cost, which he finds lay chiefly in the "extras" that the owner of the house wanted in the latter case. The cubic contents of the houses were approximately equal. Both houses were well built, and yet by sacrificing personal preferences to more typical demands, the one house was built for almost half the cost of the other.

That the average family in the United States could afford to purchase its own home, if it did not feel that other things such as radio sets and automobiles were more desirable, is evidenced by a recent survey made by the National Industrial Conference Board, contrasting a pre-war budget and the cost of living with a budget recently compiled by the U.S. Bureau of Labor Statistics from a systematic investigation of 100 workingmen's families in Detroit.

The average income among these 100 Detroit families, practically all derived from factory earnings, was $1,711.87. Under the pre-war budget this income would have been divided in the following percentages: Food 43.1 per cent, housing 17.7 per cent, clothing 13.2 per cent, fuel and light 5.6 per cent, and sundries 20.4 per cent.

The Bureau of Labor investigation shows the income now divided according to these percentages; food 32.3 per cent in place of 43.1 before the War, housing 22.6 as compared with 17.7 in the earlier year; clothing 12.2 as compared with 13.2, fuel and light 6 as compared with 5.6, and *sundries* 26.9 as compared with 20.4.

The conclusion reached from this study by the National Industrial Conference Board is that there is a steady advance in living standards as indicated by the decreased proportionate income required for food and the marked increase in sundry expenditures, and the material increase in the cost of housing. They infer that the latter is due largely to the increasing demand for modern baths and bathtubs, which they infer cannot be obtained without price.

That the realtors of the country are aroused to the menace to their business in the high cost of home ownership was made evident in an address delivered in Chicago some months ago by Leonard P. Reaume, President of the National Association of Real Estate Boards. After calling attention to the fact that the greatest single business in the country is the real estate industry, and that its function is to provide housing for persons, for business, for commerce and manufactory, and that directly and indirectly it employs about $\frac{1}{4}$ of the country's labor, and that 15 per cent of the total national income is devoted to its activities in new con-

struction, replacement and repairs, Mr. Reaume proceeded to call attention to the importance of stimulating home ownership, and of removing the present obstacles to it.

To his mind, notwithstanding all the advances that have been made in business technique and new processes, there has been a retrogression in the market for homes for persons of small means. As he says, while other industries through improved technique and economies in manufacturing have constantly reduced the price of their commodity and at the same time improved its quality—thus bringing it within the reach of the great masses of buyers—in the real estate industry they have pursued the opposite course.

He illustrated this by pointing out that during the last 15 years, when the Ford automobile has been cut in two in price and at least doubled in efficiency, the single-family dwelling has doubled in price without a corresponding increase in comfort, durability or beauty, and adds that because the cost of home ownership has doubled during the last 15 years it has been placed out of the reach of the great majority of our population. He wisely says: "The instinct for home ownership is strong. It needs little or no encouragement. It needs only economic opportunity to function."

Taking the oft-quoted figures that 84 per cent of the family incomes in the United States aggregate $2,000 or less and the figures of a survey made in his own city of Detroit not long ago which showed that the average family earnings were approximately $1,800, Mr. Reaume points out that a family which earns the latter amount cannot afford to pay more than $500 a year for housing and have sufficient funds left for food, clothes, education, insurance, savings, care of children, and the other normal requirements of civilized life.

He finds that $500 a year is not sufficient to buy a home with civilized conveniences and modern facilities upon any terms that a person can pay to-day, and that the utmost that such a family can afford in the way of a home is one costing approximately $4,500. But workingmen's homes are not to be had for that price to-day; in most cities they cost $7,000, $8,000 to $9,000. As he points out, such homes require a monthly payment of $70 to $80, thus demanding half the total earnings of $\frac{4}{5}$ of the people of the United States.

Mr. Reaume outlines 4 possible approaches to the problem of reducing the cost of home ownership in the United States. These are the following: First, reduction in the price of home sites; second, reduction of the cost of

building; third, reduction of taxes; fourth, reduction in cost of financing the purchaser.

Taking up the first of these, Mr. Reaume points out that the preparation of home sites by customary subdivision methods is exceedingly costly and wasteful, and urges that this whole process should be brought under some form of intelligent control and adjusted to the actual necessities of the community at the moment. While deprecating Government control or regulation, he urges a system of voluntary control which will overcome these difficulties. He also urges more efficient methods of using land. He calls attention to the fact that most subdividers make too many paved streets which are expensive to construct and to maintain, rightly calling attention to the fact that the automobile age requires wider and fewer thoroughfares with elimination of as many cross streets as possible. He points out that the old gridiron or checkerboard plan which has been rightly held up to scorn by city planners for many years is no longer adequate for conditions as they exist to-day, and says that we could close half of the cross streets in most of our cities without particular loss in traffic efficiency, and estimates that the saving in the cost of a lot would probably be as much as 15 per cent.

The new methods employed at Radburn of long blocks with cul-de-sacs and separation of foot traffic from wheel traffic, with few cross streets, strongly commend themselves to him, not only because they make homes more desirable, but because they reduce the amount of land necessary for homes by a good proportion and also reduce the cost of street and other installations.

The second avenue of approach to reducing the cost of homes Mr. Reaume finds in reducing the cost of building.

He rightly emphasizes the antiquated methods that are still employed in home construction, pointing out that building materials are still being made to fit the size of a man's hand, and are transported to the site and assembled in the course of two or three months by the most expensive methods of hand labor that the world has ever seen, and rightly contrasts what would happen if automobiles were constructed in similar fashion. He strongly urges, in place of these antiquated methods, the methods of modern industry, of factory fabrication and mass production, and says the layman can see no reason why a bathroom, for instance, should not be manufactured as a unit and put into its place complete. He does not see why wall sections cannot be developed which are complete both as to exterior and interior, and insulation which could be fitted into place.

To the old cry that standardization in the manufacture of houses will result in monotonous dwellings, he very rightly calls attention to the fact that we have monotonous and standardized homes at the present time, and says that the great masses of homes in most American cities are as like as two cracker boxes, and poorly built at that. Mr. Reaume sees no reason, however, for assuming that fabrication processes applied to dwellings need necessarily result in monotony, pointing out that the automobile industry probably makes more extensive use of mass production methods than any other commodity, yet it is possible for the buyer to choose between some 600 or 700 different models made by approximately 50 different companies—which he finds a wide enough range of choice for the taste of any man. The same, to his mind, would be true of fabricated dwellings produced for the masses. He urges that the whole construction industry should study this problem.

A third direction in which Mr. Reaume sees possibilities of removing present obstacles to home ownership is in the reduction of taxes—local, state and federal. After pointing out that in the average city considerably less than 20 per cent of the money expended by the local government and taken from taxpayers may be said to benefit real estate, he asks the question why 80 to 90 per cent of the cost of local government should be saddled on the man who elects to own his home.

A fourth means of removing the obstacles to home ownership Mr. Reaume finds in reducing the cost of financing the purchaser. He says if the financing costs of the home buyers are high it is due in large part to some of the high costs, waste and risks which have been previously indicated, and wisely points out that the financing of homes cannot be made cheap until many of the elements of risk and divided responsibility in the building and selling of homes that now exist are removed, and finds certain handicaps now existing in the laws of various states with respect to junior financing whose removal might be helpful. The usury law of many states makes second-mortgage business as he says virtually a bootleg business. Other elements in the financing costs are recognized.

Mr. Reaume concludes his discussion of this subject with a plea to all those who are interested in encouraging home ownership to consult together to see if by some step the present obstacles to that desired end can be removed, pointing out that we must not lose sight of the fact that the home, in which we are all interested, is itself too costly at the present time for 80 per cent of the American people to buy.

FIFTY WAYS TO LOWER HOME-BUILDING COSTS[1]

By ROBERT T. JONES
Technical Director, Architects' Small House Service Bureau, Inc.

There are only two ways to erect your home at less expense. The first is to get a contractor who will agree to build your home as you want it, without reducing qualities, at a lower price. The second is to reduce your requirements, to take less than you want, both as to quality and quantity. These are the only ways to reduce costs. Your home will cost more or less, depending upon what sort of a bargain you can drive with the man who builds it, and the qualities of materials you use and to what extent your home is completed.

Probably the oldest way to get lower prices for what you want is to bargain for them. In building this is done by taking bids. Contractors compete with each other for the privilege and profit of building your house. If good contractors are selected for this purpose, every one of whom is competent to build a good house, this method is a wise and fair one to follow. Then the comparison of prices is drawn between like things and it is safe to rely on the low bid. But competition between high grade contractors and cheap contractors often puts the former in a position of disadvantage. They cannot compete with the low prices quoted by the cheap contractors because they will not do the grade of work that satisfies the cheap contractors. Since you also do not want that kind of work, estimates should not be taken from poor contractors. We do not propose that you lower costs of building by substituting inferior qualities of workmanship or materials, for that would not be true economy.

All this is on the presumption that you will have one general contractor in charge of the building of your house. We believe this is the most satisfactory method for small home builders. You make your contractor responsible for turning over to you a completed building in acceptable condition. He not only provides for completing the actual building, but may be made responsible also for the heating, plumbing, electric wiring, and electric fixtures, though some money can be saved by sub-letting contracts for these last items. If sub-contracts are given to separate contractors, choose them with the same care that you would exercise in selecting the general contractor.

Some builders have tried the expedient of eliminating the general contractor altogether and letting all the various parts of the work to sub-

[1] Adapted from "Fifty Ways To Lower Building Costs," *Small Home*, January and February, 1926.

contractors. By this method the owner becomes his own general contractor. He must make the sub-contractors accountable to him. He must synchronize the different parts of the work, get the various sub-contractors on the job at the proper time, adjust differences, buy materials, pay for mistakes he makes, spend an amazing amount of time on the job. This is generally not a good method unless the home builder is unusually familiar with the buying of materials and the direction of labor, and is able to solve the many problems that arise in building. This scheme of building eliminates with the general contractor all of his skill, judgment, and experience, which are worth a great deal. When the owner assumes these responsibilities he also assumes the liabilities that go with them. Let us repeat that we do not think it wise to dispense with the general contractor unless the owner is widely experienced in building.

Suppose then you have taken bids, compared what the contractors and sub-contractors have to offer, picked the best ones, quality and price considered, and the money they require to build the house the way the specifications and drawings call for it, *giving you just what you want,* is $1,000 too high? What can be done? To the solution of this problem can be applied the second method of reducing cost. You can eliminate certain items. You can cut down the qualities.

The first essential to a program of reducing the contractor's bid is to know what the drawings and specifications call for. Go over the drawings with great care. Be sure you know what is required. Then eliminate what you do not need—partitions in the basement or attic, porches, fireplace, excess millwork. Get down to the basic facts.

Then you must study the specifications. Almost every clause of this document charges you with a liability to pay. For example, floors may be of oak, pine, maple, or other materials. And if of oak, then which one of the five different grades? With your architect or contractor to help you, you must decide, and with your decision will go certain increases or reductions in total expense.

You do not require warning not to attempt to save money at the cost of sound methods of construction or to use materials of a quality too low for durability. That would be fatal, and this story does not advocate such a course. But there are things about the house that you can do without for the time being at least. Certainly also for the sake of owning your own home you can get along with some of the more democratic materials and finishes—the middle grades—durable but not luxurious materials.

The following list is comprised of suggestions for keeping down costs. Please remember that the values we give are only approximate. You will

have to verify them in your local market, as they will vary in different localities. The figures we give are presumed to be average and could ordinarily be anticipated in building a small house of two stories of about 750 square feet ground area.

1. It is not necessary to partition fully the basement. If partitions are omitted at the time your home is built you can put them in afterward yourself. Only enough to enclose the fuel bin are really needed. You may save from $50 to $150 in this way.

2. Game rooms are popular. They make an interesting use of basement space. But the cost is high if the room is furnished at all well. $300 to $400 would not go far in a room of this sort. You can save it.

3. The fireplace has been called the heart of the home. Nevertheless a home will run pretty well without it. If you can bring yourself to omit it, the lowered cost of labor and material may amount to $300 or $400—perhaps more.

4. Many wooden houses are improved by the appearance of a brick base course. A stucco house must have some kind of masonry course at grade, and brick is often used for this. If you use brick then select a quality that is within your means. The higher the base course, the more it will cost. You may save from $50 to $150 through careful study of this item.

5. One of the most effective and easy ways to save money is to omit the porch. In certain climates this would mean a sacrifice of comfort, but often the porch is not absolutely essential. In any event it may be added at a later time. The cost ranges between $200 and $500 or more, depending upon design and size.

6. Glazing a porch is expensive for it requires not only the extra window sash but also the wood trim and its painting, and more expensive flooring than is used on an open porch. The whole additional expense may run as high as $500. You can have the porch glazed later when your funds will permit you to do so.

7. Screening the porch is an extra expense. Full length screens for the windows cost more than half screens. Metal screen frames cost more than those of wood. The wire used in making the screen cloth is of steel, either painted or galvanized, or of copper or bronze. Qualities and durability vary with the cost. Buy the grade of screen you can really afford.

8. The Building Code Committee of the United States Department of Commerce has investigated foundations for small homes and has found it generally true that a well-built nine-inch foundation wall of brick or concrete is such an excellent device as to make the building of a thicker wall

unnecessary. You can decrease costs by using the thinner wall provided it is soundly constructed. Thicker walls are required by some ordinances. Peculiar soil conditions may make them necessary. But foundation walls are often built unnecessarily thick.

9. The prices of brick, poured concrete, concrete blocks, or wall bearing tile for foundation work vary with the locality. Brick costs less than concrete in some districts; concrete is less expensive in others; and so on. Poured concrete and concrete blocks should be compared from the point of view of price since conditions of the market and at the building site may show that one of these materials has a real price advantage over the other.

10. Most of our modern homes have full basements, yet it is fair to inquire if this is always necessary. A full basement involves deeper foundations and more excavating. A full basement is not an absolute necessity. The saving involved in omitting it may amount to $600 or $700—often more. No matter how much basement you have, you may put in the cement floors later if you cannot afford them now.

11. If the basement excavation is in clay, perhaps you can use the excavation cut for one side of the concrete forms. There would be a saving in doing so. Some building codes do not permit this. If the work is well done, it is nevertheless quite satisfactory.

12. Tile is desirable for bathroom floors, but its greater usefulness does not extend into wainscots and coves. Money spent for tile work must be in keeping with your funds.

13. If you stucco the exterior of your home, be prepared to pay from $150 to $250 more than for wood siding. If the stucco has an especially modeled surface, expense is increased.

14. If you build of brick, the initial extra expense may run from $500 to $800 more than for the average wooden finished house. Remember, however, that homes finished with exterior walls of masonry carry a better fire insurance rate and there is a reduction in the cost of future painting. Depreciation is lessened. Even though the initial cost of masonry walls is more, the final cost is less. But you may not have the capital for a building of this class.

15. Wooden shutters bear an important relation to fine appearance in small homes. The improvement they add is out of all proportion to their small cost. Even so, they are not essential to fine appearance and they may be added later when you have more money. If the cost saved per pair applied is $10, it is easy to see how $100 may be saved.

16. Almost all of the devices used to ornament the exterior of your house carry with them an extra cost. When you add wrought iron railings at the door or around the windows, there is an extra cost for the iron work and also for placing it in position. The actual cost must necessarily depend upon how much of this is used. A wrought iron railing around the door may readily cost more than $50.

17. Perhaps your inclinations are toward a bungalow, but your insistence on having all the rooms on one floor will almost certainly have the effect of increasing expense. Two-story houses take less foundation walls, less excavation, less roof.

18. The style of architecture of your house has an immediate bearing on its cost. For with certain styles of architecture it is difficult to achieve desired effects without going to added expense. If, to have a house at all, it is necessary for you to cut down costs, then choose a simple type of architecture. Rectangular houses generally cost less than those built from plans of irregular shape.

19. Wide siding has a better appearance than narrow siding, but the latter costs less. Various kinds of woods used for this purpose cost different sums. Ready stained shingles used for the side walls of frame houses usually cost less than wide siding. Adjust this item to your pocketbook.

20. The initial cost of wood shingles for roofing is less than tile or slate, although wood shingles are not as durable and they are less fire resisting. Fire laws in some localities require that you use certain special types of roofing materials. There are variations in prices and qualities for each kind. High quality counts heavily, but do not attempt to buy variegated tile with a wood shingle pocketbook. If you have wood shingles brush coated, be prepared to pay from $25 to $50 more. If the shingles are dipped the expense will be increased still more, but their durability will be increased. It is better to omit such items as the porch, which can be added at any time, and to spend the money saved on better materials that count for permanent construction, including the roofing.

21. Fire stopping in frame walls is recommended by the National Board of Fire Underwriters. It is designed to reduce losses by fire. Installation of fire stopping material involves an expense of from $75 to $150. Whether or not you may omit it depends upon the location of your building with respect to the fire limits and the extent of your home building budget.

22. We are especially interested in good construction and earnestly recommend that you insist upon it if you hope to make your dollars buy

full value. In this connection we think that all exterior wooden walls should be insulated, wherever the house may be located, for insulation performs a real service in fuel savings and in comfort. It is effective in both hot and cold weather. You, therefore, cannot afford to omit insulation in regions of severe winters, but elsewhere it is relatively not so important. An expense of from $75 to $350 is involved. Buy the type you can afford.

23. Built-in fittings in the kitchen cost from $100 to $300, depending upon their design, the finish, kind of wood used, and how extensively the kitchen is fitted with them. It might be less expensive for you to do without built-in fittings, at least temporarily, substituting therefor the ready-made devices of the kind. Unless the built-in fittings are extremely well designed, the ready-made kitchen cabinets are preferable and they may cost you less.

24. Extra built-in millwork such as bookcases, wardrobes, china closets, costs heavily. They become real luxuries when means are limited. The actual amount involved depends on how many of these conveniences are used. And you can always buy them when you can afford them.

25. The graceful open stairway with its turned balusters and spiral newel is a delight to the eye. It lends an appearance of quality to the house. But stairs between partitions cost much less. A plaster parapet at the side of the stair is less expensive than an open balustrade.

26. A built-in refrigerator with outside icing door and raised platform is more expensive than a separate refrigerator not so advantageously equipped. A refrigerator waste is also an extra expense. The type of refrigerator must be selected with an eye to the limits of your purse. You may save from $25 to $50 on this item.

27. To the mechanically inclined American the idea of an electric refrigerator installed in the home is particularly intriguing. However, it is not essential that this equipment, no matter how desirable, be installed at first. It may be classed properly as one of the worth while devices you will provide for your home when you have the money for it.

28. Perhaps you do not need to finish all the rooms just now. Omitting the plaster, finish flooring, and wood trim in rooms not needed at first will save something. It would be cheaper in the long run to have all the work done at once, but your ready funds may not permit it.

29. When moldings, kitchen cabinets, doors, and sash are supplied from "stock," they cost less than devices of this kind made to special designs. If you are trying to keep down costs see what your contractor can get

ready-made from his local lumber dealer's stock. "Special" millwork always costs much more.

30. Hardwood floors cost more than those of soft wood. In every kind of wood there are various grades with varying degrees of expense. For example, as between the first and second grades of plain oak flooring, there may be a difference of $50 or more in the cost of building your home. The medium grades are durable, and if the millwork is well done, and you have good workmanship with good painting, staining, and filling, appearances will be fine.

31. The cost of wood trim varies as does the cost of flooring. Soft wood is less expensive than hardwood for interior finishing. Soft woods such as fir and pine can be used to advantage and at a saving, especially if they are painted. Some of the inexpensive woods, such as cypress or poplar, stained or oiled, are beautiful. As between hardwood and soft-wood trim for your home, there may be a difference of $50 to $100.

32. Before you have the woodwork finished, find out about the relative expense of stain and varnish, painting, and enamel work. The finish of stain and varnish costs less than paint. Paint costs less than enamel. There may be a difference of $100 or more in the last two methods. If you enamel only part of the house and paint or stain the remainder, your expense will be decreased proportionally.

33. A bare plastered wall finished smooth is not a pleasing sight, especially to the housewife who loves color and pattern. And yet here is a part of your home making that can be postponed. In the meantime if walls settle a little and the plaster cracks, repairs can be made before decorations are finally applied. The actual reduction in the total cost of building is worth while, especially if you do not have the ready money.

34. The quality of glass used in your house will affect building costs directly. Plate glass costs more than ordinary window glass. Mirrored doors are an extravagance for anyone who must exercise strict economy. French doors, however beautiful, cost money. Perhaps you can omit them for the time being, especially from such openings as the one between the hall and living room.

35. A clothes chute is certainly a convenience, but it could hardly be called an absolute necessity. Properly built of metal and with self-closing doors, it must cost $25.00 or more.

36. Like practically all the other materials that go into a house, plumbing fixtures are manufactured in several materials—vitreous china, solid porcelain, or iron coated with enamel. Each of these has its special

qualities, but the chinaware is more expensive than enameled iron. The extra expense for chinaware is balanced by its advantages in the way of appearance and ease of cleansing but the enameled iron is also durable and costs less.

37. The simple leg tub has practically gone out of style, having been displaced by the recess type, but the latter not only costs more in itself but requires an extra expense in framing and plumbing. A recess tub may cost as much as $50 more than a leg tub. In the different materials and designs in which this fixture is offered there is a wide range of expense.

38. Lavatories cost more or less depending upon the size and style and the material of which they are manufactured. Between a solid porcelain lavatory and one in enameled iron there may be a difference of $50. The substitution of an ordinary chain and plug waste device in place of the "pop-up" waste may save $5.00.

39. There are a great many types of water-closets. They are obliged to be made of vitreous chinaware. The simple ones are satisfactory if well made. You can save $25 to $50 by selecting a simple and economical fixture of this kind.

40. The kitchen sink is usually made of enameled iron. Sinks with aprons or with drainboards cast on are more expensive than those without either or both of these. A wooden drainboard is less expensive than one of enameled iron. Combination hot and cold-water faucets will cost from $5 to $10 more than separate faucets.

41. In the laundry you may spend various sums for tubs depending on what they are made of and their size and number.

42. Hot-water heaters present a fine opportunity for you to spend your money or economize it, depending upon how easily you are satisfied. Those types of hot-water heaters which operate so that there is always a supply of hot water are certainly most convenient, but they cost more to operate and the first cost of the equipment is greater than for the type which may be turned on from time to time as required. Costs vary with the convenience afforded. Your plumber will demonstrate this for you.

43. There are several types of heating plants. All are satisfactory if they are well designed and properly installed. Each one has special qualities which distinguish it from the others, and there are differences in costs as well. Personal preferences are usually quite fixed in regard to the kind of heating system that must be used, but you may not be able to buy the particular kind of heating system you prefer. In order to have your house, you must be prepared to take here, as elsewhere throughout the building,

what you can afford. We urge you not to buy a cheap heating device whatever system you select.

44. A heat regulator should go into every home as a definite means of maintaining even temperatures and of decreasing costs of fuel, but one of these regulators costs from $50 to $150, and so may be outside of your immediately available funds. You may have your house wired for this and install it later on.

45. Since low radiators can be placed under windows they are in the best position to overcome heat losses that take place through the windows. In this position they also leave wall space for furniture. These are advantages the high type radiators do not have, but the high type costs less. You are the one who must decide and who must pay the bills.

46. The equipment of the radiators is another item of variable expense. For example, the valves may be of the ordinary kind, or they may be "leakproof," which cost more, or you may have the "indicator" type. Compare costs on this equipment. Take what you can afford.

47. Heating pipes should be insulated. The better they are insulated the more satisfactory the heating plant will work—the lower its cost of operation—but the quality and expense of this insulation has a direct influence on the initial cost of your home. Get a good job here even if you have to wait for it.

48. Hardware represents an opportunity for you to exercise economy. There is a wide difference between the appearance of an ordinary pressed steel doorknob and one made of cast bronze in the form of a lever handle. You must decide whether you will spend $100 for hardware, or $200.

49. Electric fixtures, like hardware, do not ordinarily represent a very large percentage of the total building cost. Yet there is a difference in quality and in design and finish, with which go differences in cost. Cast brass fixtures must necessarily cost more than those spun from thin sheets of this metal. There will be a saving here if you are careful. Tastefully designed fixtures may be obtained without excessive cost.

50. The cost of wiring your home will be affected directly by the number of outlets for lighting fixtures and switches that are supplied. The convenience afforded by numerous outlets should be recognized and yet it is wholly possible to install more than is really necessary. The cost is fixed by the rate per outlet. It will be seen that the omission of even two or three at $4.00 per outlet would mean something.

The above are some practical ways to assist you in reducing the cost of your home. If you will go over each one, *preferably with a competent*

local architect to help you, to see how you can make it apply to your building, and then if you will learn from your contractor the amount of money saved by each one, you will see just what the total sum saved amounts to. Your savings may easily amount to as much as $1,000. Be sure to cut out the nonessentials first, things that can be replaced later on. But never reduce qualities or workmanship to a point where durability is threatened.

OMITTING THE CELLAR TO CUT BUILDING COSTS[1]

The millions of dollars invested in the cellars under American homes have been described as "buried treasure." It has been estimated that over two billion dollars have been spent in cellar construction. This means for houses already built. And the busy estimators have figured it out that at the present rate of home building there will be invested annually in new homes over three hundred million dollars for cellars alone.

The first cellars in American homes were provided in districts where rigorous winter weather demanded insulation of the first floor against the penetrating of cold air. The most feasible method was realized to be the provisions of at least a shallow air space beneath this floor and, as excavation was also necessary for foundations, it soon became customary to provide full cellars which were also found useful for storage and partial refrigeration purposes.

The advent of central heating plants, including hot air, steam, and hot water systems, all coal burning types, was the next step in the establishment of the cellar as a fixed habit in home planning. For the heating plant was located there with the fuel supply.

During recent years the high cost of building materials and labor has forced home builders as well as investment builders to consider ways and means of reducing the cost of building. Rooms have grown smaller, ceiling heights have been lowered, hallways cut down, beds and furniture built in the walls and even the dining room is now being classed as an unnecessary room.

A recent development in small house construction, along this line of greater economy, has brought to light a big opportunity for saving—that is the elimination of the basement, and the placing of a central heater on the first floor of the house. According to some of the country's leading architects, this represents a saving of at least 15 per cent of the total cost of a small house. Until a few years ago, the builder of a small home was forced either to build a basement to house his heating plant, or else to

[1] In *Small Home,* November, 1925.

heat his home with stoves and fireplaces. Several of the leading heating plant manufacturers have made a scientific study of ground floor central heating plants, and there are now various forms of such heaters on the market which heat five or six rooms very comfortably.

It will not do at all to build a cellarless house without taking into consideration matters of ventilating the space underneath and removing the top soil and following out other principles of sound building. While the cellarless house is not a new idea in any sense of the word a good deal of attention is nowadays being given to this type of home, because of the fact that it offers one way of reducing the cost of a small home.

SUMMARY

THE COST OF THE HOUSE

High costs of houses and difficulties in financing handicap home ownership. With costs as they now are, a family of a low-income group must necessarily live in the cast-off house of a family with more money, and the problem of housing becomes one of keeping the standard high for every new house that is erected. Since the cost of a particular house varies considerably in the different sections of the country, little information has been gathered on actual costs. The United States Department of Labor has collected information on dwelling costs for a number of cities. These cost figures compiled by the Bureau show decrease and increase in costs over a period of years. Some information also is available on the cost of each class of work necessary in building a home, cost per cubic foot, and costs of building materials.

METHODS OF REDUCING COSTS

Many suggestions have been made for reducing the cost of houses. Most methods, however, have not been sufficiently tried out to determine their importance as factors for reducing costs. The best known of these methods are the following: Mass production; standardization of building materials; more factory-made parts; use of new building materials and better use of old ones; elimination of waste in construction processes and materials; less expensive improvements; cheaper financing; reducing the cost of advertising in selling building materials and equipment; better processes in construction; year-round building—overcoming irregularity of employment; reducing the speculative element in cost of land; uniformity in building codes and elimination of certain features in the indi-

vidual house, such as cellars, basement partitions, fireplaces, etc. Although the opinions of housing specialists differ as to the amount of cost reduction by these suggestions and methods, processes and changes that will net even a slight reduction are worthy of consideration.

The United States Department of Commerce through its elimination of waste program has reduced the number of varieties of building materials, which has been a factor in cost reduction. By the use of the requirements drawn up by the Building Code Committee waste also may be eliminated. Some of the wastes occurring in the building industry are due to management and to labor. The reduction of housing costs may also be brought about through the enlargement of credit facilities and through the elimination of the speculative element in cost of land.

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CHAPTER III

THE HOME SITE

1. Selecting the Home Site

PROPERTY CONSIDERATIONS IN SELECTING THE HOME SITE[1]

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AND

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Basis for the choice.—One thing that a man should never forget when he is buying a home is that the home will be the center of his family life probably for many years. His children will be brought up in it and amidst its surroundings. In it his wife must do most of her work, and in it both he and his wife will spend most of their leisure time. He should, therefore, look at the different properties available and see how they measure up by these common-sense, practical standards. It is well for the family to picture itself going through its daily routine in the new house—cooking, cleaning, going to work, school, play, etc., at all seasons.

The mere fact that a showy mantelpiece is displayed, that a 4-inch steel I-beam supports the floor, that a radio set has been installed, or that several French plate glass mirrors are built in doors should not determine the buyer's choice or induce him to pay an additional $500 for the property.

List of considerations.—In making sure that he is acquiring a satisfactory home, a buyer, whether he realizes it or not, usually takes into account most of the factors given below. Several of them do not apply in the case of purchases in towns and cities of moderate size.

Before buying, one should consider:

[1] From *How To Own Your Home* (Washington: Better Homes in America, 1929), pp. 14–18.

A. General location.
   1. Low or high land values.
   2. Transportation facilities: (*a*) To place of work and (*b*) to shopping centers.
   3. Protection offered to homes: (*a*) Private restrictions, (*b*) zoning ordinances and city planning, and (*c*) fire and police protection.

B. Specific location of the lot.
   1. Character of the neighborhood.
   2. Location with reference to schools and playgrounds for the children.
   3. Desirable points for the lot: (*a*) Shade trees, shrubs, and planting; (*b*) set of house with reference to sunlight and prevailing winds; and (*c*) character of the soil and necessity for grading, filling, or draining.

C. Other safeguards in buying property.
   1. Danger in buying a lot too long before building.
   2. Extent of street and public utility improvements (paving, sidewalks, water supply, sewerage, electricity, gas).
   3. Possible assessments.
   4. Proportion of lot value to total outlay.
   5. Checking property values: (*a*) Land and (*b*) house.
   6. Plan of house and quality of construction.
   7. Steps taken in buying.
   8. Examination of title.

General location.—Choosing the general location for a home is usually a matter of compromise, but none the less important. A little forethought may show the futility of searching for property in certain sections, or perhaps limit the choice to a given district, which will permit better use of the time spent looking for the right lot.

Low or high land values: In larger cities one must decide between a small lot in a more convenient and accessible location, where land values are higher, or a larger lot farther away from the center, where land is not so expensive. This problem is often closely bound up with that of a single detached house as compared with a double house, or a house in a row. Detached houses on large lots are preferable, but on narrow lots they frequently have middle rooms that depend for light and air on side yards only 3 or 5 feet wide and may not be so desirable as good row or semi-detached houses.

A site with a yard, especially where grass can be grown, is particularly desirable for families with children, and a space for a vegetable garden is also one of the advantages that may go with a good-sized lot.

Transportation facilities: The general location of the home may depend

largely on the part of the city in which the members of the family are most likely to be employed. It should be either within walking distance of the probable place of work or in reach of good transportation. The mere promise that a trolley or bus line will be provided is not enough. Ability to reach shopping centers is important for the housewife.

Protection for the home: If a city is zoned it is almost always safest to buy in a residential district where there is safety from intrusion by factories, public garages, and scattered stores.

If there is no zoning law, how about private restrictions? Are there any restrictive clauses in the deed? In the deeds for all other houses in the block? If even one or two lots near by are unrestricted, objectionable buildings might be erected on them. Is there a requirement to build a house of a certain minimum cost? Could that much be afforded? Are the private restrictions such that a home will surely be protected? For what period do the restrictions run? It often happens that the private restrictions were made to run for, say, twenty-five years and they may be about to expire, leaving the home unprotected. Verbal representations concerning other buildings in the neighborhood are of no binding force on their owners.

The advantages of having a home within the jurisdiction of good fire and police protection are obvious.

Specific location.—Within districts that meet the family's needs as to general location, the task of choosing a site may be made easier if the points that affect the price or desirability are kept in mind and can be readily balanced against each other. Many people, for instance, object to a street on which there is much noise from street cars, or on which there is heavy truck traffic at night. Streets carrying through traffic are often dangerous, especially to children.

Character of the neighborhood: While a family may think that it would like to live close to relatives and friends, this factor should not be given too much weight. Nevertheless, the general type of people living in the neighborhood is important, especially if there are children in the family, who should be brought up in the right kind of surroundings.

Schools, parks, and playgrounds: Where there are young children much of the family's welfare and peace of mind may depend on being near, say, within a half mile, of parks, playgrounds, and good schools. The opportunity for wholesome outdoor play is the birthright that few care to see their own children deprived of, and if playgrounds and schools are not near by, additional cares and burdens are placed upon the mother.

Desirable points for the lot: There is no denying the fact that most people prefer a lot that is well set out with trees and shrubs and that can be made neat and attractive. The set of the house with reference to prevailing winds and to the points of the compass may sometimes be a deciding factor.

Not only the size and shape of the lot but its location in the block deserve attention. For instance, one side of a house may be made most unpleasant if the kitchen or garage of a corner house next door is too close. A corner lot has advantages, but it may be doubly assessed for street improvements, and requires longer fences and sidewalks, which must be cared for both in winter and summer.

In general, land that is well drained is best for residential purposes, and a lot on firm, dry ground is better than one on marshy soil. House foundations resting on filled-in soil almost invariably damage the house by settling. The cost of foundations and cellar may vary greatly with the character of the soil. Sometimes rock close to the surface makes a lot more expensive to develop. Where grading or filling will be necessary, an estimate of its cost should be obtained before the lot is bought and added to the price asked for the land. Few people appreciate how much filling may be necessary to bring a low lot up to the right level.

Buying a lot.—In many cases a family buys an improved lot and starts building on it within a few weeks or months. This is vastly different, as noted above, from buying several years in advance of building. While there may be enough increase in land values, in the latter case, to give some profit, a speculation is involved. The outgo for taxes is sure, and there may be special assessments for street and other improvements, which must all be added as part of the cost of the lot. There is also a continual loss of interest on the money invested in the lot. Lots are frequently sold to innocent purchasers in a territory that will not be developed for years. It is to be noted that some cities prohibit building where sewers have not been installed. One should consider all the factors mentioned in the preceding pages and obtain advice from some dependable, reputable, local real estate dealer, not from some transient, or fly-by-night promoter, who sells out to "suckers" and moves on.

How much to spend for the lot: The question of how much to spend for the lot itself depends largely on whether or not it is "improved." Where streets, curbing, sidewalks, water, electric, gas, and sewerage improvements have not been made, a lot may sometimes be obtained for less than 5 per cent of the total cost of the house and lot, and 10 per cent should

probably be the upper limit. If all improvements have been made, the cost of the lot frequently runs up to 20 per cent, but it should rarely exceed 25 per cent. "Front-foot" values, as shown by recent genuine sales, and assessed valuations may serve to check values.

The less expensive the lot the more money is left for the house itself, and a well-constructed home on a cheap lot is far more desirable than an unsatisfactory house on an expensive lot. Although a house that is very much more expensive than its neighbors might be hard to sell at a good price, a very cheap house may add nothing at all to the sale value of an expensive lot.

Checking property values.—A fair appraisal of the house and lot should be obtained from a disinterested third person. The intelligent man usually wants a better guide than the price asked by the seller, who may either consciously or unconsciously ask too much. The value of the house and lot, or the lot alone, is determined largely by its desirability for a home. The general and specific location, and the public improvements available all have their influence. Their value can best be estimated by an expert.

An appraisal of the property by a building and loan association is generally safe. Sometimes financial institutions will loan approximately 60 per cent of the value of the property. If they will not loan more than 40 per cent of the price asked, it may be assumed that the price is too high. The judgment of dependable real estate dealers is always worth while.

Making the purchase.—Customs vary in different localities as to the method of arranging a mortgage and completing the purchase of a piece of property. In many places it is common to have a purchase offer or a sales contract signed in advance of the actual transfer of the property. In the purchase offer the buyer agrees to pay the holder a certain sum for the property, provided certain conditions are complied with. When this offer is accepted by the owner it can be used as a basis for arranging loans with which to complete the transaction.

If the intended buyer makes a cash deposit with his offer it is particularly important that he should specify in it whether movable property, such as window shades, gas fixtures, stoves, and other items are included, and should state that risk from fire or elements is assumed by the owner until the title passes. The offer should also be dependent on whether the buyer obtains a satisfactory loan to get the money needed to pay for the property, and on the owner's furnishing papers showing a good marketable title, free from back taxes, liens, encumbrances, or objectionable easements. It is important for a buyer not to bind himself until he is sure ex-

actly what he is to pay for and has made definite financing arrangements. Otherwise he may suffer severe loss. The services of a good lawyer at the time the purchase offer is made may be advisable.

Examination of title: One must be certain that the title to a piece of property is good. The validity of a title may be insured by a guarantee company, or its soundness assured by an abstract company or a competent lawyer. In obtaining a loan a bank will insist on some such evidence that the title is good. Some banks and building and loan associations include a title search in the transaction. The buyer should satisfy himself that the boundaries and corners of the lot are legally as represented to him.

In connection with the title it is well to note whether there are any easements which might, for instance, grant a right of way to a neighbor, or allow a telephone company to place its poles upon or near the lot, or a water company the right to run its mains across the property.

Sometimes the title to the house is taken out in the name of both husband and wife.

THIRTY THINGS TO BUY BESIDES "FRONTAGE"[1]

If you want to base your home-building project "on solid ground," literally as well as figuratively, you should "look beneath the surface" of the real estate deal—figuratively as well as literally!

A home is more than just a house. By the same token, a proper home site is more than just so much dirt. It may or may not have the qualities that make it desirable as a permanent location for a dwelling, and profitable as an investment in real property.

So here is a list of thirty items by which to judge whether the lot you are thinking of buying is mere real estate or a good home site:

1. Buy the knowledge of a dependable real estate expert; that is, patronize a dealer of high standing in the community.

2. Buy an appraisal. Consult a second disinterested real estate man or a professional appraiser and pay him his relatively small fee for making an analysis of the value of the property before you purchase it.

3. Buy an absolutely clear title. You may require the seller to establish his title to the property before you buy it, or you may employ a lawyer or a title guarantee company to search the title for you. This is vitally important and is worth the expense.

[1] In *Small Home* (Architects' Small House Service Bureau, Inc.), January, 1927.

4. Buy exact boundaries. Don't take the seller's word as to property lines, but see that they are accurately established at the time when the title is searched.

5. Buy sunlight, not smoke and dust. If you are going to the trouble of acquiring your own permanent home, you might just as well have it in a location that is sure to be healthy for your children.

6. Buy exposure to the winds that prevail in summer. When looking over the lot, keep in mind the house you intend to place on it and try to see whether or not it will be comfortable.

7. Buy enough land. The minimum should be from 40 to 60 feet of frontage. Old-style 25 and 28 and 30-foot lots in crowded districts are poor investments. The wider your lot, the greater your chances for a price increase.

8. Buy solid earth. In filled-in tracts, or "made" land, there always is a danger of poor drainage or a chance that the house will settle. Either settling or bad drainage will damage the structure.

9. Buy high land. This is necessary if drainage is to be satisfactory. A low lying lot may mean a waterproofing problem.

10. Buy level land. Filling a lot to bring it up to the desired level is almost as costly as excavating.

11. Buy land of good shape. A lot of irregular outline may prove difficult to sell.

12. Buy good soil. Remember that excavating in rock may prove more expensive than you wish to undertake, that quicksand or other defects of the soil may result in damage to your house, but that under-surface sand or gravel may be an advantage if it is of such quality that it can be used for the mortar, plaster or stucco.

13. Buy land fully developed or already under development. It is safer, though more expensive, than acreage which may be developed in the distant future.

14. Buy water and gas mains, graded and paved streets, sewers, walks and curbs already installed, or else add the estimated cost of taxes for these improvements to the price of your lot. Property with all these utilities in and fully paid for should not cost you more than 30 per cent of the total investment you plan to make, though 20 per cent would be a much safer figure. Land without these improvements should not cost more than 10 per cent of the total.

15. Buy moderate taxation. If you have any choice as to the state,

county or city in which you intend to build your home, acquaint yourself fully with the taxing policy of the authorities and estimate what the taxes will add to the cost of maintaining your dwelling.

16. Buy good transportation to your work, church, schools and shopping centers. Measure the distance, not in miles, but in time it takes to get there. The ideal home lot is three or four blocks from transportation lines and stations.

17. Buy good collateral on a building loan; that is, choose a lot on which a bank or building and loan association will advance you at least 50 or 60 per cent of its value. If they won't lend you more than 40 per cent you may question whether or not you are paying too much.

18. Buy fire and police protection. See that your neighborhood is well served by these city departments.

19. Buy partnership in the community. "Restricted residential districts" may serve as protection against persons with whom your family won't care to associate, provided the restrictions are enforced and are not merely temporary.

20. Buy the right to build according to your own standard of living. The building restrictions may call for a more expensive house than you can afford to build and maintain.

21. Buy a well-balanced investment. That is, don't put much more or much less than one-fifth or one-fourth of your total funds into the lot. The construction should cost you three or four times the purchase price of the land.

22. Buy a sound investment, so far as you and your appraiser can judge future values. Population and transportation are the two chief elements in increasing home-site values. Be sure your property is in the line of residential, not industrial or commercial, growth of the city.

23. Buy freedom from easements; investigate thoroughly to find out whether or not any one has any right to lay pipes or erect poles or make a right-of-way on your lot.

24. Buy good location within the block. Remember that a corner lot may be double-assessed for streets and sidewalks and that it will require longer fences. See that your lot is such that your neighbor's kitchen or garage won't be a nuisance.

25. Buy a real share of parks, playgrounds and schools. An ideal location is about half a mile from these.

26. Buy freedom from traffic dangers and noises. A through street

may prove a menace to your children and to the daily comfort and the nightly slumber of the whole family.

27. Buy a chance at future favorable development. Examine the chances of public utilities, parks or boulevards being brought closer to your property in the future—and then be sure that such developments would be to the advantage and not to the detriment of the property.

28. Buy "a sure thing." If at all possible, it would be well for you to rent and live in a neighborhood for a year before undertaking to buy and build there.

29. Buy beauty. Too many trees are better than too few; natural objects of beauty will save you the cost of development and will help you dispose of the property advantageously when the time comes.

30. Buy a home, not a speculation. You would accept many things in buying just to make money which you wouldn't consider if you were buying for permanence. Set your ideal high—you probably will have to modify it, but it's safer to modify a high ideal than a low one.

Of course, a home lot possessing all these thirty advantages may be more than an ideal—it may be a physical as well as a financial impossibility in your town. But these are the things you should have in mind before you buy. Don't let any one "talk you out of them."

2. Selecting the House for the Building Site and Its Proper Placement

THE BUILDING SITE DICTATES THE ARCHITECTURAL STYLE[1]

By H. E. WICHERS
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The happy combinations of house and site, examples of which we all can recall, are very seldom just "happen so's." They are the result of someone's careful analysis and study. The designer received an inspiration that has gloriously materialized. He studied his plot, knowing that all other elements were subject to it and could, within certain limits, assume many positions or shapes. Thus, with the plot as his definite beginning, he based his whole design upon it. And rightly! One must start with something. What can be more definite than the plot of ground upon which the structure will stand? Further, it is individual in every case. It is rarely a misfit and is expensive to radically change.

[1] Adapted from "Fitting a House to Its Site," *American Architect*, May 5, 1928.

So economics, too, arrays itself on the side of the man who says, "I'll leave the plot alone as much as possible." The alteration of levels is expensive. When one tears down the existing site and builds a new one to fit a preconceived design for the house, he is confronted with the problem of making the new site harmonize with the neighborhood. This is not always an easy task. Further, it is costly, and, unless there is some defect in the site as it exists, it is not advisable, however often demanded.

Even in this day a very large per cent of our house sites are forced to receive preconceived ideas of plan and form, ideas that were decided upon before the site was purchased. That this practice is harmful needs no jury decision.

The problem of fitting the house to site, like most other "problems," tends to solve itself, if we can bring our thought to bear upon it free of unbiased opinion and thus study and analyze it. By such careful study we recognize the various elements that tend to push the lines of the design this way or that; we learn to be swayed and guided by those existing elements and let the building grow into the plot, shaped by them. This is, after all, much the same process that the tree undergoes during its growth.

The trees of a western Kansas prairie are few; those that grow are low. They stay close to the ground. There are many natural reasons why this is so. Wouldn't it be wise to listen to the argument of the trees in this case? Its logic is forceful, there must be something back of it. Suppose we change to another climate where the trees grow tall and broad. The forces of Nature, judging by the tree growth, will not destroy that which stands up from the ground. It may be well to make use of this hint in any house we build in such a location.

We find a tree on a hillside. In the example in mind, it is broad and fairly tall. Its neighbor is tall and thin. The ground contour at their feet, however, is similar. Their roots on the lower side are partially exposed and in both cases these roots hold together a sort of terrace that is fairly level on top. Clearly the tree has adapted itself to the environment and judging by the appearance it would take much to move it. This should hold a suggestion to be considered in connection with other elements that present themselves in a hillside problem. Observation will present much information in regard to any plot encountered that will not only be interesting but very helpful.

Simple intelligence can and will solve the problems of site. But intelligence cannot operate without that which it operates on; namely, the numerous facts about any given problem.

The above does not mean that there is one and only one solution to any site problem. There are usually several, any of which, if properly worked out, may be excellent. The possibilities of variety in houses and in sites is unlimited and makes for a happy condition. It forces many of us to think, whether we will or no.

There is no known law by which one may solve all site problems. A site may belong to a type, but to say that a hillside house is thus and so is wholly impossible, because hills have a happy characteristic of varying in pitch; they may be wooded or bare, rough or smooth, with no two alike in every respect. We may classify any plot to a general type and gain thereby, but after that we must look to these individualities and peculiarities for any special character that we may wish to give the house.

Probably the profile of a house for any given location is the most important single factor because, after careful study, it will be seen that the other elements, such as materials, fenestration and plan, may be changed to a marked degree and not materially derange the effect of a harmonious profile. To be sure, the proper and pleasing arrangement of materials, plan and fenestration add much to the house and cannot by any means be forgotten. Yet it is possible to have all these in a well-built house, and because the profile is wrong, the house will be a total misfit for a particular site.

As previously stated, it may be possible to reduce any plot of ground to the same general classification of many others, but each problem has, nevertheless, some peculiarity which, if recognized, will lift a design at once out of the ordinary. It is in this manner that careful observation contributes to the house by giving it and its site a feeling of unity and individuality.

It is well to remember, when trying to fit peculiar situations, that certain types of houses have already been developed to conform to the general characteristics of many different environments. There are types for the heavy foliage background with irregular outline and plan. There are prairie types with strong horizontal lines. There are hillside types which recall the lines of the site and at the same time appear to be firmly rooted into position. There are hilltop types with irregular skyline where the house becomes a fitting climax for the site. There are orchard background types where the ground may or may not be sloping. If the designer will recognize to which of these classifications the site in question belongs, he has limited it to a certain species. This will help materially in shaping the lesser details in such a manner as to bring about the "house individual."

In any example of the heavy foliage background, the skyline will be irregular in outline. The contour of the ground may be steeply sloping or vary in degree to that which is practically flat. Perhaps the sharp irregularities of the plot itself will call for sudden steep slopes or a drop in the roof level. In any given case, the profile of the building should recall in some manner the profile of the background, accentuating it, possibly contrasting with it, but nevertheless bringing about harmony.

There are many English houses that have been developed for sites similar to those suggested. The Spanish, too, has been used in similar locations. The Pennsylvania Dutch type of rambling Colonial work also does well under such conditions when carefully shaped to the requirements.

In the matter of materials, half timber is excellent, as are also stone, brick and wood siding. Just how these should be used in each case should be determined from the design in question.

If, from the above site, we should suddenly change our location to flat prairie land, almost bare of trees with the horizon as a background, we have changed our environment radically. Here there is practically no suggestion of the vertical. All is horizontal. The trees such as exist will be short and most of them will have been carefully fostered by man. From the far distance to the foreground will appear a series of low, slightly curving, rolling lines, except in such instances where they have been usurped by man.

It is not difficult to imagine a client desiring a house with strong vertical lines on such a plot. Neither is it difficult to see why such a combination would ordinarily be out of place. If we bend our profile to the demands of the site, we must in some manner recall the background. Of necessity, there will be some vertical lines if the house is of any size, but these should be minimized as much as possible by the use of transitional members in the form of garden walls, banks of shrubs and clipped gables. In the matter of materials, half timber is seldom appropriate. Stone work does well. Stucco is at its best in such surroundings, because it is plastic and can be flowing in line. Wide siding accentuates the horizontal lines. Steep roofs are rarely usable. There are Spanish types that can be used in such places very appropriately, as can also certain types of the English, Colonial and French, the limiting feature in each case being the profile.

In trying to limit the hillside type to any particular outline, we are confronted by the great variety of hillsides, some of which have been suggested under the discussion of the heavy foliage background. The main characteristics, however, are fairly definite. The line of hill, be it steep or

gentle in slope, is definite. A house built upon it must not appear to be restless. Battered walls help to obtain the desired effect. Shrubs properly placed are fine. Proper terracing, however, is in the majority of instances the most effective and is the method most often seen in Nature. The profile for the hillside will be influenced greatly by immediate surroundings. On a wooded plot it might conform but little to the line of the hill, while on a bare plot it would necessarily give much attention to it. Here, too, the materials used would be determined by existing conditions. For the wooded area, half timber used with shingles and siding would fit admirably, as would brick and stone. For the bare hillside, stone, brick and

FIG. 5.—A successful hillside placement. This English style house is particularly suited to its hillside location. (Courtesy of H. E. Wichers, Kansas State Agricultural College.)

in some cases stucco could be made to look well. The material in every case should be determined by the existing conditions and should, of course, be secondary to profile.

The hilltop site presents still other problems together with suggestions for their solution. Very little difficulty is encountered in making a house in such a place appear solidly placed. Neither should the size of the house bother greatly. The profile, again, is the thing. It is important because a house in such a location is seen most often in outline.

Here, again, the degree of slope in the sides of the hill, the extent of the area on top of the hill, together with the nature of the foliage, can and will alter conditions in most every instance. It is possible to say that this or that house is a hilltop type; but even ten or a dozen such designs would not fit every new hilltop site. They might, however, help one to hit upon a scheme that will fit exceedingly well.

The author has encountered still another distinct site type. Reducing them to types does help to isolate characteristics. In the language of the mathematician, it reduces the number of unknown factors, leaving the mind clear to solve for those that remain.

There is a very common type of site which is most often found in fairly flat country. The ground may be gently sloping or flat; the trees are not very high, perhaps about twenty or thirty feet. They have been planted. They didn't just grow and are usually in rows or in regular order. The horizon appears a long way off and may be disregarded. This site type is common in our suburbs and farmsteads the country over. Such a site seems made to order for our own Colonial architecture, especially the irregular Pennsylvania Dutch Colonial and the squat and contented Dutch Colonial. The Spanish, too, can be made to fit into such surroundings as can the English, but these need careful adjustment, while the Colonial types mentioned have already been acclimatized. The materials most often seen are siding and stone, but stucco and brick, too, are not out of place.

Perhaps the latter type of site is the best understood of all house sites, for in it we find the greatest number of really well-designed houses. Perhaps, too, almost any design, if not too vertical in line, can be made to fit into such a background. Then, too, the Colonial is our heritage. We build our Colonial house and then build the landscape to suit because in the majority of instances we choose the level fertile site. So, building the landscape means planting trees and shrubs and building fences.

The unusual site, however, is fast finding favor and needs careful study. One cannot place Colonial houses on every site that exists, and in such places we must remember that the lines Nature accentuated are "large type" signs that it would be well to heed. For, by following Nature's lead, we not only get valuable suggestions for the profile and mass, but economic plan suggestions as well.

FITTING YOUR HOUSE TO ITS SITE[1]

By J. DUNCAN HUNTER
Architect

To build the house is simple, to create the setting is from difficult to impossible; and in all cases expensive and out of proportion to the cost of the house. The natural setting should be preserved intact and the house designed to fit. It is this lack of fitness which prevents the American com-

[1] In *Garden Magazine and Home Builder,* April, 1925. No longer published; see *American Home.*

munity from having the charm of the European village. In Europe, they never think of the house without the setting or garden; while here in America too often a house is a house and the garden a separate and distinct thing, a fad for the wealthy. Gardens are expensive in America, chiefly because we set up artificial standards in our domestic architecture. We design houses that are entirely foreign to their surroundings and then we attempt to create a setting for them. In Europe they fit the house to the setting and with very little gardening the effect is complete and charming.

In America, we are prone to dwell upon minor details of the house with but scant consideration for the scheme in general, its fitness to the setting and to the community as a whole. We think in terms of the individual house and parts of that house, whereas we should think in terms of the vast open country or the complete village, that the parts may be properly subordinated to the whole.

Often, and without real consideration, the owner decides he wants a Colonial or some other type of house, perhaps he has seen an old Colonial homestead set behind large trees on a large level plot with old outbuildings, fences and gardens, a real picture. Then he purchases a plot in a community where hills, ravines, rock ledges and the great natural irregularities prevail, and can still picture nothing but the old Colonial homestead as his home and insists upon that type. He feels that the lot is undesirable and expensive to build on because of the natural ruggedness, but "the neighborhood is good" is his excuse for buying it and because of the irregularities the price was not high. He does not consider that the natural setting determines the type and style of house more than any other factor. He utterly fails to appreciate his diamond in the rough.

If the plot selected is one of those elevated above the street or with ledge rock abounding, he immediately starts to work to level down the plot for his Colonial house. He cuts down the trees, blasts out the rock for his cellar, carts the material away and builds his home—very often a white frame farmhouse. When the house is completed he starts work on his garden. He removes all outcropping rocks, he fills in the ravines, builds retaining walls to support the embankments, and makes a smooth level lawn with a formal garden of old-fashioned flowers, sets out some spindling saplings or some Christmas trees from a nursery and feels that he has done something. He certainly has! To create a Colonial house and a Colonial garden (so called) on such a rough plot meant much work and expense.

But the result! Is it pleasing? It is not! It is flat, tame and uninteresting. The commonplace effect of a level lot and smooth lawn. He has destroyed the natural beauty of the plot, the irregular contour of the land. The rugged beauty of outcropping rock is gone; and the priceless old trees have been cut down as otherwise they would have been left elevated on mounds that were too high or in ravines that were too low for the level lawn. Further, even when the house and planting have acquired the mellowness of age, the place does not fit in with the adjoining scenery and no matter how well executed in itself, if it fails in this respect the result can never be successful.

If, at the start, the Colonial type of house had been abandoned and an irregular English cottage type selected, there would have been no expensive grading and landscape construction work, the natural beauty of the plot would have been taken advantage of without cost, the old trees could have been saved and the finished result would have had a sense of fitness that imparts the charm which no artificial circumstances can create.

Of course, the house would need to be properly designed, a rambling irregular type that suits the natural site. And it should be constructed of local and not foreign materials, so as to maintain a definite relation and tie between the house and its setting.

An inspection trip through any of our suburban communities must convince a careful observer that most of the houses are designed in the haphazard manner, with little or no regard for their fitness to site and community. We see Colonial frame farmhouses perched on top of rock ledges which demand a "medieval castle" or a "lighthouse" type. We see a "medieval castle" bristling with towers and pinnacles set on a broad level plot of monotonous uniformity. We see houses built on the hillside with deep cuts and fills to give a level plot for a Colonial house whereas an irregular English type would have made a picture. We see plots that once boasted rocky ravines below the street level and with fine old trees, now as level as a parlor floor, and a nice white Colonial farmhouse with center entrance built level with the street with no trees, no ravines, no rocks—a bald, monotonous and commonplace affair.

With a plot of this type the ravines, rocks and trees should have been left intact and a house of early English or medieval French type should have been designed, with bridges thrown across the ravine from the street level to a terrace at the first floor level of the house. The basement should have been left entirely exposed and a sunken wild garden developed.

It must be remembered that opinions and tastes not only vary, but that they change also, often in a short space of time suffering a complete reversal or refutation. One condemns what is not understood. One becomes tired of the commonplace and longs for something interesting and romantic. Many, who have a distinct dislike for the antique, become its greatest advocates when they learn to understand and appreciate it.

FIG. 6.—This house has been designed to show rugged simplicity in harmony with its natural wooded background. (J. Duncan Hunter, architect.)

The decision to have a Colonial house should not be made merely because of a liking for the neat prim appearance of the exterior, the formality of symmetry in design and bright interiors, the effect of a multitude of large windows. Rather let the requirements of the lot determine the type of house—at least the exterior masses and detail. The interior can then be modified to reflect the individuality of the owner.

Often before the house is completed the owner, having decided upon the type he thought he wished to build, without due consideration to the requirements of the land and without thorough acquaintance with other architectural types, condemns his own first judgment (when too late) and

feels that he should tear down the house and start over. This is a bitter disappointment, for, as a rule, one's "dream house" is built but once in a lifetime and then often only after years of anticipation.

Unhappily, the notion is still current that four walls and a roof make a house and that a lot is measured only by its width and depth, with straight lines and square angles, that the value of the house is in proportion to the square feet of floor space it provides for living purposes and that the value of the lot is in proportion to its frontage and to its approach to a billiard-table level. Obviously, four walls and a roof do not make a house, they make a box if well built. A regular rectangular, level plot is not the most valuable nor the most desirable, but rather the least so for a country house. The third dimension in the lot—that is, the contour—is of more importance than either frontage or depth. The more irregular the lines of the lot and the more irregular the contour, the more pleasing the result if the house be properly designed.

Of course, an irregular lot is difficult to handle; it requires a thorough understanding of underlying principles and requirements and then much study and work, but, the more difficult the problem, the greater the study required; and the results are, in direct proportion to the amount of this study, something that is distinctive, fitting and beautiful. That which comes easy usually has no intrinsic merit.

It is for this reason that altered houses often possess greater artistic merit than new ones. The conditions set up by the old building require study and planning with the result that new ideas are born and something of beauty created.

One thing, however, must not be lost sight of; you cannot expect a boy to carry a man's load, and with difficult irregular lots, an architect of ability is required. Further you cannot tie a man's feet and expect him to walk, neither can you throttle an architect's imagination with a set of obsolete dining room furniture which simply must be used in the house or tie him up with "stock" doors and windows, and expect him to create a masterpiece. The architect must overcome the difficulties of the irregular lot and the requirements of the owner but he must have a free hand to solve the problem in his own way.

This does not mean that the ideas, tastes, and requirements of the owner are not to receive due consideration; quite the contrary, but they must all be put through the melting pot, the dross burned off and the gold retained, if there is any of the finer metal left after the refining process. This is the function of the architect, his duty is not to prepare drawings,

specifications and details, but to create through his powers of imagination. The "mental picture" which the architect forms of the house and its entire ensemble is of greater importance than all of the work that follows after. If it is poorly conceived, the results are doomed, for the house in its relation to its surroundings, the many different angles and perspectives involved, the effect of trees and other natural conditions, to say nothing of the orientation and effect of sunshine and shadow, cannot be adequately portrayed on paper and one must fall back upon the mental picture of the house and its setting during the translation of the picture into building material.

ARCHITECTURE AND LANDSCAPE ARCHITECTURE SHOULD BE INTERDEPENDENT[1]

By REXFORD NEWCOMB
Professor of History of Architecture, University of Illinois

Architecture and landscape architecture have, down through the ages, gone hand in hand. How close this association has been, has not generally been well understood in America or, if understood, not well remembered. But the careful student of the history of architecture is cognizant of this age-old association of two important phases of the human shelter problem, and can point with assurance to the splendid coöperation between architecture and landscape development in such lands as ancient Egypt, Japan, China, and India. To come closer to our own time, thought, and feeling, he can recall the landscape development of the *atria* of the Greek, Roman, or Pompeiian house and the splendid planning of both the Roman metropolitan and provincial *fora* in relation to the public buildings which surrounded them. He can remember the lovely courtyards of Saracenic Persia and the colorful patios and terraced gardens of Spain or North Africa, the magnificent landscape setting of the villas and palaces of Renaissance Italy, and the woodland entourage of the chateaux of France and the manor houses of old England.

In the old days, apparently, it was not too much to expect the architect to be also the landscape architect, and for ages these two arts were practiced by the same artist, as indeed were often also the arts of painting and sculpture. With our era of high specialization and the consequent segregation of related arts into what often proves to be almost water-tight

[1] Adapted from "Modern Tendencies in Architecture and Their Influence upon Landscape Architecture" (an address before the Annual Convention of Illinois Garden Clubs, March 19, 1930).

compartments, a sad lack of sympathy and understanding has often arisen between the practitioners of these arts and this, in turn, has all too often wrought a serious divergence between the arts themselves.

In America, it appears to me, this hiatus is more pronounced than elsewhere. This is due, no doubt, to our peculiar educative and economic system which provides more and more for specialized preparation and segregated practice as time goes on, or it may come about from the peculiar American habit of doing just as we please, regardless of others.

While in some quarters there is a fine growing collaborative spirit between the architect and the landscape architect, it is *all too seldom* that anything that may be called a real collaboration takes place. Here is usually what happens. The client calls in the architect and commissions him to design the structure. This the architect does, to the best of his ability, and often succeeding in admirable fashion. When the structure is complete, the landscape architect is called in "to plant the grounds," as the client says, and as anyone may guess, often has a difficult task at harmonizing and making less obvious and objectionable mistakes that the architect, due to his lack of knowledge of landscape procedure, often makes in developing a site.

I hope we shall soon come to the time when the landscape architect will be called in at the same time that the architect is called, and that the problems of how best to develop the property, both architecturally and from a landscape standpoint, will be studied concurrently. Certainly the architect, as well as the landscape architect, would profit by such a collaboration, and best of all, the client would come nearer getting what he is paying for.

Often a tract is capable of several architectural treatments, but susceptible of but one best landscape solution. Could the architect know this solution, both through his own eyes and through those of his landscape collaborator, how much more adequate and beautiful his own architectural solution might be.

On the other hand, I have found all too often a tendency upon the part of the landscape architect to feel that his mission was to obliterate as completely as possible the work of the architect, and the true function of a landscape setting lost sight of. We see upon all hands really fine architectural essays marred by indiscriminate planting of unsuitable material that can do little but discredit both the architect and the gardener. Coöperation should be the keynote of all such matters, and coöperation

early enough in the undertaking that it will actually accomplish the one best solution.

The exposure to the sun, to prevailing winds, and winter storms is an important consideration, both in the selection of a site and afterwards in the utilization of it. While tastes vary with respect to the matter of orientation, it is perhaps a good rule to remember that one should avoid an arrangement that permits storms to beat at the exits, front or rear. In summer one wants cooling breezes, but in winter he hopes to avoid them. Often view or outlook is the making of a site otherwise quite uninteresting, and outlook has operated always to enhance the value of property.

Topography, the "lay of the land," largely determines the beauty of a site and holds its possibilities for development by means of landscaping effect. Moreover the more extreme types of topography actually dictate the style of house, its lines and form. Historically this consideration, like that of climate, has had a marked effect upon the development of architectural form. The architectures of two lands as far different in spirit as are those of Egypt and Switzerland may be cited to prove this contention.

Since a structure must always "belong" to the site, a study of the lines of the house, in relation to these aspects of the site, is important. One can do in a hilly situation that which a plain will not gracefully permit and *vice versa*. Sloping contours beget similar architectural contours; broad, horizontal terrains foretoken horizontal lines. Roof lines, by their direction, may tie a house to its site, while planting affords a natural and graceful transition between the vertical house walls and the more or less horizontal plane of the ground.

Natural objects, like outcropping stones, fine old trees, a genial knoll or a winding stream we may add to a picture that is already rich with suggestion. But any site, no matter how fine, can, and often is, ruined by injudicious development, the wrong placing of the house, the selection of a house type that does not emphasize or fulfill the splendid suggestion offered by the setting. In a sense, the site is to the house as the mounting is to the diamond, except that in the case of the house we have the mounting first. The task, then, is to select the gem (architectural) that will best enhance the site. Then the site must be sufficiently modified by the landscape architect to bring harmony out of the combination of natural and man-made forms. These are essentially the central problems involved in developing any site.

Once the type of plan adapted to the site is determined, and the land-

scape development is predicted, one may proceed to the actual house plan, always keeping in mind the purely architectural considerations which so materially influence the success of the house.

CONSIDER THE HOME GROUNDS BEFORE PLACING THE HOUSE ON THE LOT[1]

By M. E. BOTTOMLEY
Professor of Landscape Architecture, University of Illinois

The position of the house on the lot is of primary importance. It was the custom in Colonial days to build houses very close to the street, thus conserving all possible space in rear for flower and vegetable gardens. In the nineteenth century in North America, the garden in rear gave way to the large front lawn, often too big for the house and certainly wasteful of space. Deep lawns will not improve a street unless it be very wide; deep lawns along a narrow street only emphasize its narrowness. The front yard which is wider than deep makes a lot appear wider than it really is; the deep narrow yard makes it look narrower. Any enclosed area appears larger than an open area because it is a unit with definite boundaries and not a part of a larger space by comparison with which it seems small. Whether a front yard is enclosed by hedge or fence will depend on the custom along the street. Strikingly different types of houses or yards, though individually attractive, detract from the beauty of the street. The appearance of size is not so much needed in the front as simple dignity. In the past generation, it was the tendency to reduce the size of front lawns and make way for more spacious back yards.

In many cities a minimum building line is established for each street; in others, conformity to custom has created a line. Variation of a few feet in this building line is often desirable to break the monotony along the street.

The front yard's function is that of a foreground and a setting to the house. The question then becomes, how much ground is needed to present a house properly. The depth should certainly vary with the surroundings —greater in suburban districts and much smaller where congestion occurs and crowding is commonly seen. Everyone has experienced the feeling of being too close to a building to see it; you needed to back away in order to take in the entire structure without moving the head. The hori-

[1] Adapted from *The Design of Small Properties*, pp. 5–14, 1929. By permission of The Macmillan Co., publishers.

zontal angle of vision for close-up objects is about forty-five degrees, consequently one should be about the same distance from a house as it is wide to see it well. The angle of vision vertically is less than horizontally; tall buildings, then, need deeper fore-grounds than low buildings. Enough space is needed in front of any good building to present it to persons in passing as one architectural unit.

In the set-back of the house from the street fewer mistakes are made than in its location from the side boundaries. The house should seldom if ever be placed in the center of the lot because this usually wastes space. On one side of the house, and usually on the kitchen side, will be a driveway. How much space is really necessary here? The drive itself need be no wider than eight feet. In addition, a strong boundary hedge is desirable on the property . . . . which, if planted in common with the neighbor, requires only two feet but if planted one foot inside the line takes up three feet of ground. A one-foot grass strip may well be planned between hedge and drive. The house and drive should be separated by another turf strip which will give room for a shrub at the house corner. Thus with four feet a minimum distance from lot line to drive, eight feet for drive itself and about three feet from it to the house, a total of fifteen feet would seem to make a satisfactory development possible.

But the driveway might be reduced to seven feet; the bounding hedge could be replaced by a wall or fence . . . . and the total distance from the house to property line reduced to even ten feet on very narrow lots. The minimum width on this service side of the house is not used on larger lots because good appearance demands an ampleness in keeping with the remainder of the property. Grounds one hundred feet wide need sixteen feet or more; on seventy-five-foot lots probably about fourteen will look best; on fifty- and sixty-foot widths twelve or thirteen feet are sufficient. By using the minimum space on the service side of the house, ground will be gained on the living-room side which can be used to better advantage.

Next to the house, the garage is the important feature of the average lot, so often thoughtlessly placed. Because of its prominence and the necessary drive to it, the placing of this building may make or ruin the whole design of the back yard. Many times the garage is placed too far toward the rear. This results in a distance from the street too great for backing out and a Y turn is made projecting nearly thirty feet across the rear lawn. On a fifty-foot lot, this nearly cuts the back yard in two, and on a seventy-five-foot width it is still a serious interference with better uses of the space. To one who wishes to make only the front yard attrac-

tive and is willing to use the rear for ashes and a garage, this may be satisfactory.

Nowadays, most persons want more privacy than is found on the front porch; they want their living-quarters in the back yard as relatively spacious as their living room in the house. To obtain this, the rear yard must be planned thoughtfully, and the garage in particular must be intelligently placed. As the size of the garage cannot be reduced, obviously any reduction must be in the driveway. To accomplish this, the garage will be nearer to the street. . . . .

Large lots can afford to give the room for a Y turn, but even here the garage should be just far enough behind the house to allow the projection of the turn to clear it. . . . . Already there is some pavement here leading to the kitchen and cellar entrances, and to this the drive joins, making one general service area. If the same space can be used for walk, driveway and drying-yard, less total area will be required, and the lawn will remain unbroken.

The drying-yard may be included in this general service area by the use of a clothes-reel. Often the removable clothes-reel can be placed in the kitchen side of the lawn and not interfere with its use for pleasure on the other six days of the week. However, in households where the drying-yard receives almost daily use, a permanent place is necessary. If the garage is near the house, the drying-yard may be directly behind it. The wire lines may run from the garage to a two-by-four piece supported on two posts twenty or twenty-five feet away. This location has the further advantage of privacy.

A common defect of house plans is the location of the coal-bin and coal-window. The usual small house plan puts the kitchen and dining-room next to the driveway and the livingroom on the other side of the house. Then the fireplace and chimney are frequently on the outside of this livingroom, which makes it seem logical to place the furnace and coal-bin underneath and leaves the coal-window on the side away from the drive. The inconvenience of this can readily be seen; the coal-window should be on the side by the driveway.

Picture Mr. Home-owner when he returns one evening from his business. The coal company after an unexpected hard shower has delivered a part of the winter fuel supply. The sun has come out again and Mr. Home-owner drives home exulting in the benefit this shower has bestowed on his lawn and garden. With the first glance at the lawn, of which he was so proud, his satisfaction changes to dismay. There on one side of the

lawn in the soft earth are the deep-cut ruts made by the heavy truck on its way to the coal-window. Why had they sent coal on a day like this? He had especially warned them to deliver his order after a long dry spell because the window was not within reach of the driveway.

But on more sober thought even irate Mr. Home-owner could scarcely blame the coal office. The weather had been dry for weeks and the rain was very unexpected. Then the truth dawned upon him. Here was a perfectly good drive on the opposite side of the house. Why was not the coal-window here, too? Grocery, laundry and other trucks use this drive to make their deliveries to the kitchen; the heaviest truck of all must drive across the lawn. Just as the garage had been placed fifty feet behind the house when it should have been twenty, so this location of the coal-window showed the same faulty planning. . . . .

PLACEMENT FOR SUNSHINE[1]

By DAVID STONE KELSEY

Throughout the seven thousand years of known human history, between the tropic of Cancer and the sixtieth northern parallel the vanguard of human progress has ever been found. Notice the fortieth parallel. Every turning-point in world history, every present-day commercially important metropolis, and every politically influential capital is located within a few hundred miles of this line!

Here the world's thinkers have been born and here made their marks. But it would seem that always our last thought has been for the physical advancement and comfort of men. For instance, balanced rations for live-stock of all kinds were perfected, taught, and used decades before our own children began to be properly fed. That simple, wonderfully effective sun-trap, the ordinary cold-frame, was invented and applied to the vegetable kingdom a hundred years before sun-parlors for vegetable-eating mortals were considered useful.

Do you ever reflect how few weeks of the fifty-two we northerners really must avoid direct sun rays? In the latitude of Boston, June 20 to August 10 is about all—50 days out of the 365, with many chilly mornings among these. Eight months every year we live by sunshine—if we can get it.

Therefore, sunshine in every room in a building is one of its greatest needs. The house wherein this chat is written is such an one. Facing

[1] Adapted from "A Place in the Sun," *House Beautiful*, October, 1925. Reprinted by permission from the *House Beautiful* magazine.

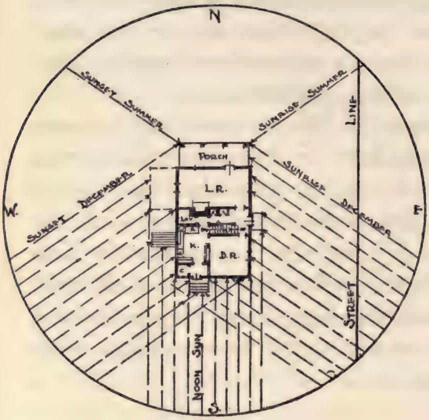

FIG. 7.—Here the house faces squarely east and the dining-room will have the morning sun, but the porch is on the wrong side for a sunroom from September to May.

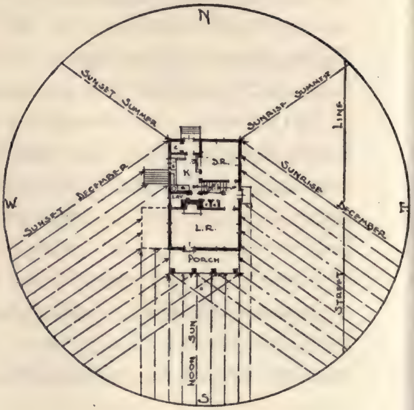

FIG. 8.—Here the plan is reversed so that the living-room will receive sun most of the day, but the placing is not as yet ideal.

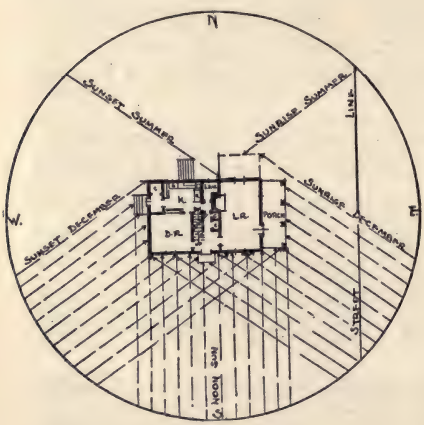

FIG. 9.—Here with the house turned end to the street, the living-room is broad side to the warming, welcome sun but there are still several windows that the sun does not reach in winter.

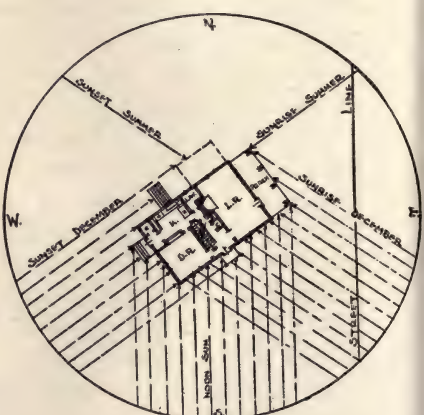

FIG. 10.—With this arrangement, by late February every window admits some sun daily.

about 30 degrees south-to-east, its broadest side looks squarely toward the winter sun. Early mornings, the same sun hits two sides. But more, by late February, in bright weather, the sun shines into every window daily—on each of the four sides in its turn. Even closets and storerooms, having windows of their own, are so reached and purified. The relation of this house to the points of the compass is seen in Figure 10.

By March 20, no matter in what state or latitude one lives, the angles of the sun's rays—beginning due east at sunrise and ending due west—daily sweep the full southern half-circle, 180 degrees. Yet if this house were set facing squarely east—its northwest side thus being turned due north—that whole north side would get no winter sun whatever. Equally bad, in summer, its south side would be pounded all day by the sun; whereas, set as indicated in this diagram, this sunny side, beginning soon after 2 P.M., now stands in the shade nearly all the hot afternoons. Even the southwest side of the house gets less sun as this angle, because it is a slanting sun.

Finally, thus set, a house is as nearly oriented—turned squarely east—as it can be, and will wholly avoid the hot, morning sun on its north side, in summer.

Of course if one is so heedless as to crowd a dwelling-house vulgarly close to the "veranda line," its front line must, to look passably well, conform with that of the street. But given a deep, wide lot, to face one's house so-and-so, just because the street is at that angle, is as silly as was the Colonial notion—that every dwelling must be erected four-square to the points of compass.

Now let us look at Figure 7—a position of the house, facing east, commonly referred to as "ideal"—and see if and wherein it really may be bettered. True, the kitchen quarter is on the shady side for morning work, and for afternoon leisure or callers, the front rooms are then on the shady side. But the fine, roomy veranda is on the wrong side to be available as a sun-parlor from September to May.

In these same months, one would be especially glad to get sunshine in the living room, a dining room being closed most of the daylight hours, but notice how the best rays of the winter sun strike squarely on only the "closet" quarter of this house.

In Figure 8 the plan is reversed and the improvement in room arrangement partly corrects the above objections, and locates the ice-box where it should be. Yet, taken as a whole, it, too, is far from ideal.

Figure 9 is much better. With the house set thus with its end toward

the street, we have the living room turned broad side to the warming, welcome winter sun. True, if one's house is squatted close to a neighbor's on the south line, his buildings will totally cut off the low-slanting, winter sun—without doing this in summer, when needed. But assuming a roomy lot, this position catches one-third more winter sun than either Figure 7 or 8, the sole remaining objection being that there are still several windows which the sun's smiles never touch, or reach only when the accompanying summer heat forbids their use. . . . . Figure 10 is the best of all. This need not make present house-owners dissatisfied. It is more than probable ideas herein suggested will cause them to rediscover good features in their own dwellings which had previously caused discontent. But each month a thousand couples plan and study to build, rebuild, or build on, and probably 85 per cent of these could be better advised than they are.

The diagrams here discussed by no means exhaust the possibilities, nor can the best pretend to be omni-useful. Yet suggestive they are where one normal-mindedly craves his physical "place in the sun."

And now a word of warning. For one to tilt his own house on a diagonal (as in Figure 10) in a row of similar-sized houses on narrow lots—where the others all regularly face the street, is worse than advertising one's individuality to a ridiculous extreme; it is to offer a gross affront to neighbors, ruining the appearance and layout of the whole street—considered as a unit.

The house whose position suggested this article is situated 125 feet back from the street-line, on a lot 120 feet front × 400 feet deep—containing more than an acre—and flanked by similar-sized lots each side. Wide spaces, large trees, and landscape artistry—all contribute to a picture suggesting pleasing individuality—not incongruity.

But for pity's sake, let us soon and forever have done with formal rows of huddled holdings of real estate! There are miles of smiling vistas on perfect roads but ten minutes by automobile beyond these vulgar sheepcotes where thoughtless thousands still huddle. There we can express our individual preferences in the placing of our houses and capture our full share of the sun's rays.

[NOTE.—As to the amount of sunlight that should be provided for each home, the authors, Wayne D. Heydecker and Ernest P. Goodrich of "Sunlight and Daylight for Urban Areas" state: ". . . . The chief element in sunlight which is known to be effective in killing disease germs is the short or ultra-violet rays, in which wave lengths rang-

ing from 2900 A.U.[1] to 3100 A.U. are known to be the most potent. Not much information is available at present, however, as to the amount of exposure to those rays which is necessary for health promoting results and for the destruction of germs; and the problem is complicated by the fact that for the most part these rays will not pass through ordinary glass of the kind that is at present in common use, nor will they kill bacteria after passing through such glass to anything like the same extent as they will where the exposure is to direct sunlight."

In regard to the minimum standard that should be set, the authors state: "What can then be regarded as reasonable—reasonable from the standpoint of the amount of land space required about buildings? The most obvious answer to this question, and the one which would involve assumptions of least uncertainty would be a standard which would call for approximately the same amount of land space per unit of building occupied by a single family as is now called for in common practice in the residential areas in the environs of New York. After considerable experimenting and calculating with different periods of time, ranging from a few minutes to an hour of sunlight penetration at noon on the shortest day of the year, it was believed, ... that one-half hour or its equivalent of such penetration could be secured for each living and sleeping room without using more land per single family house than is now the common practice,—that is without using more space per house than is at present used for each dwelling on the usual 40'×100' lots in blocks 200'×600' on 60' streets and 100' avenues. This was then taken as the basis of a practicable and workable standard the more exact statement of which would be as follows: Every dwelling and tenement should be so located and so planned as to provide in every living or sleeping room at least such an amount of direct sunlight or its equivalent as would be supplied by the sun shining for one-half hour at its maximum, or noon intensity through windows of the prevailing dwelling-house size, facing South at the winter solstice, December 21st" (*Regional Survey of New York and Its Environs*, VII, 157, 158–159).]

SUMMARY

Consider the following before selecting the general location for the home site: (1) land values, (2) future city growth, (3) transportation facilities, (4) fire and police protection, (5) sanitation provisions, (6) zoning ordinances and building restrictions, (7) condition of streets and roads, (8) desirability of section of the city.

Consider the following before selecting the specific location: (1) desirability of neighborhood, (2) nearness to schools and playgrounds, (3) provisions for water and gas mains and sewage disposal, (4) condition of streets, sidewalks, and alleys, (5) prevalence of nuisances including noise, traffic dangers—particularly if there are children in the family.

Consider the following before selecting the individual lot: (1) character of soil, (2) drainage, (3) shade trees and planting, (4) location with reference to sunlight and prevailing winds, (5) cost: Proportion of total cost of house and lot, (6) title to property, (7) method of buying.

The trend of the city's growth should influence to some extent the

[1] Angström Units.

amount to be paid for the site, for although the site is to be selected for a permanent home, the resale value of the property should be considered.

FIG. 11.—Lots are usually made 100 feet deep and as narrow as possible. The man who buys has up to now troubled himself very little about the shape of his lot. Reprinted from *Primer of House*. (Courtesy of Arthur Holden and Workers Education Bureau Press.)

Some ratio should exist between the cost of the house and the lot, although it is better to build a cheap house on expensive property than vice versa. It rarely is possible to obtain all the desirable points in selecting the home site, and in deciding upon one of a number of lots the location and site

should be finally selected which are best suited to the family's needs and desires.

Even though the lot is ideally situated there are still many problems to be considered in properly placing the house on the site for prevailing winds, sunshine, view, and attractiveness. Sunshine in every room is most desirable but not always easily obtainable. There is no known law by which houses may be suited to sites. In placing for attractiveness the profile of the house undoubtedly is the most important consideration. Certain types of houses, however, have been developed to conform to general characteristics of many environments. The natural setting of a house should be kept intact and the house designed for it.

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CHAPTER IV

ARCHITECTURE AND ARCHITECTURAL STYLE

1. What Architecture Really Is

The purpose of this chapter is to include for consideration and study those essential factors which influence architectural design. In so brief a space only principles can be stated but by study of the books included in the references at the end of the chapter sufficient knowledge of the subject may be obtained to understand the principles of architectural design and to appreciate architectural beauty. The study of houses of good design and also the study of photographs and illustrations of well-designed and attractive homes are of exceptional value in developing appreciation. A list of books containing such illustrations has been included for this purpose.

THE MEANING OF THE FACTORS OF COMPOSITION[1]

By ALAN K. LAING
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According to the late Professor Gaudet, architecture may be defined as the art and science of building. The average person knows practically nothing about either. Most of the human family gives but a cursory glance at the buildings which line the streets of our cities, and if the question is asked them, "What do you think of such and such a building?" their answer is shrouded in the fogs of vagueness. Even if they express admiration for the building in question, they have but an indefinite idea as to why they like it. It strikes some sympathetic chord in their being and they are pleased. But the fact that there is even such a subconscious basis for appreciation is a gratifying fact. It indicates that there is a nucleus upon which to build an intelligent appreciation of art and architecture. Let us then take this nucleus, this sense of the fitness of things, which is often termed taste, and think of it as the foundation of the edifice of intelligent appreciation which we hope to erect. Now of what is the

[1] Adapted from "What I Should Like Everybody To Know about Architecture," *Architectural Progress*, August, 1929.

main part of the structure of appreciation to consist? Shall it be a knowledge of architectural styles—Greek, Roman, Byzantine, Gothic, Renaissance and others? I do not think so. Architectural styles change with the epochs of history. A building is not necessarily good because it has a pleasing style of architecture. Being Gothic does not make a building beautiful. We must take something more elemental than style for the main part of our building—the factors of composition. In musical composition there is proportion, balance, rhythm, harmony, contrast, dominance, unity. In literature these are essential considerations, likewise in sculpture, in painting, in dancing. So in architecture we shall take these factors, with the addition of truth and scale, as basic, permanent and most important. In a brief space I shall try to explain the meaning of each.

Were I speaking to those who expected to become architects, I should place great emphasis upon truth in architecture. I should take time to illustrate how the great and beautiful buildings of the world have expressed clearly their purpose or function in their form. In brevity, it is perhaps sufficient to point out that certain forms in building have come to express very definitely certain social functions of mankind. It is not difficult to recognize a church, nor a state capitol, nor a library, nor a prison. The external aspect of each of these structures has been shaped to express that which goes on inside them, and so firmly established are the traditional forms that a departure is bewildering. If we entered a building which appeared to be a library and found on the inside of it an altar, choir and pews, great would be our surprise. So in a bank, in which we expect to deposit our riches, we experience greater mental satisfaction if the building is expressive of strength, security and enduring protection. To go a step further in the matter of truth, external form should express internal arrangement. Seeing a huge dome upon a building, as we approach it, we have something of a shock if we find nothing but a flat ceiling on the interior. If the exterior is pierced with great tall windows, we are confident that we shall find a large and majestic room on the interior. If we do not, disappointment follows. Lastly, should there not be truth in the use of materials? Is there any reason for graining steel door frames to give them the appearance of wood? What is the logic which leads men to paint plaster to resemble marble? The deceit is obvious. Why not frankly realize the limitations and possibilities of the material which is to be used and design in conformity with the nature of that material? If we cannot our artistic intelligence is indeed decadent.

. . . . In architecture, our ideal of beauty is built up by what we have hitherto observed. And in different classes of buildings we have different ideals. Hearing the word "church," we form an image of a certain type of structure. Now, if some church we actually see has a tower which appears too high for the rest of the building we say that it is out of proportion with the building, just as we say that a nose is out of proportion with a face when it is too long. Certain proportions for certain types of building have become the composite ideal of man through centuries of repetition and are therefore called good. Furthermore, this matter of proportion extends to every part of an edifice. The doors and windows involve proportion, likewise the mouldings around the doors and windows, the bands of ornament, the rooms on the interior. Proportion is everywhere in art, and by intelligent observation one can develop a critical sense of this factor.

Let us next consider balance. Probably because most of mankind is well balanced—physically at least—man desires balance in external objects. Balance is necessary to stability. In nature we observe an exquisite balance in trees, in flowers, in broad landscapes. We see a delicate balance in the sailing ship, in the airplane, and while a building rests upon a more solid medium, nevertheless we want it to have balance, both in mass and in interest. Lacking balance a thing cannot be perfect aesthetically.

Rhythm is in the internal and external world of man. There is rhythm in the movement of the planetary system, in the waves of the sea, in the change of the seasons, and in the daily life of the individual. Our times of sleeping, of working, of eating conform to an established rhythm. Rhythm is obviously a part of the arts. Havelock Ellis writes, "The dance lies at the beginning of art and we find it also at the end." And what is dancing but harmony of movement in measured beat or rhythm. Thus in architecture as in the other arts rhythm is an essential. In the Gothic cathedrals we are conscious of rhythm in the measured march of the lofty piers down the majestic nave. In the temples of Greece we behold rhythm in the ordered regularity of the columns around the cella. In the structures of the present day, in the dwelling house as in the sky scraper, rhythm is necessary and may be found in the window spacing, in the ornament, in the succession of stories, in the play of light and shade on different planes, in the repetition of similar geometric forms.

The meaning of harmony is generally understood. If two people live peacefully and sympathetically together they are said to be in harmony

with each other. In architecture there is harmony when the elements seem to belong to one another, when they are related in shape, in color or in design.

Contrast accentuates the importance of the elements in a composition. Richness becomes more effective when contrasted with plainness. A monumental entrance to a building would not be very monumental if there were ten others adjoining it. It gains its monumentality by contrast with less important elements.

This brings us to the factors of dominance and beauty. Imagine two domes on a state capitol, exactly alike in size, shape and importance. The result would be a division of interest and this division of interest would destroy unity. With but one dome, however, there is no hesitation on the part of the observer. The dome becomes the climax of the composition and unifies the design, all else being subordinate to it.

Scale is the factor which enables one to form an estimate of size. It is relative to the size of man. At Saint Peter's in Rome, although the vaulting on the interior rises to a height of one hundred and fifty feet, one cannot realize its immensity unless the cathedral is filled with people. This is because the elements commonly proportionate to the height of man are in this structure exaggerated. There are not enough small elements, of which the size is common knowledge, such as delicate ornament, balustrades, doors, and life-size statues, with which we may compare the larger elements. Lacking these units of measure, therefore, we cannot appreciate the enormity of the large elements and there is a waste of effect. We are not impressed as we otherwise should be.

In this brief space I have suggested the meaning of the factors of composition. They form the main portion in our edifice of intelligent appreciation. With them we have a sound basis of judgment for all art. To this main body we may advantageously add a knowledge of historic styles, and in the acquisition of that knowledge we shall see how the styles developed in accordance with the climate, materials and other influences of each country, we shall see the logic of such development, and thus armed we can observe the ludicrous combinations of style which are not infrequently foisted upon the public in this supposed era of general enlightenment. After all, it simply means that if we are to progress in art and architecture the public must have a living interest in these subjects, an interest which will constantly stimulate them to criticize with knowledge and appreciation. And if we do not criticise, if we do not demand buildings in which there is truth, beauty and reason, the mistress

art, the goddess of things lovely and great, will in sorrow and disdain depart from her dwelling amid the mortals of earth.

NOTE: What is good architecture? "If a building answers the purpose for which it is built, if its masses are grouped in an interesting and pleasing manner, if all its parts are well-proportioned—are 'in scale,' as an architect would say—not only with regard to themselves, but with regard to the surroundings of the building, and if the motives are selected with good taste, then the complete structure will be a true expression of architecture." (DEWITT CLINTON POND, "For a Better Appreciation of the Art of Architecture," *Scribner's*, February, 1923.)

BEAUTY IN ARCHITECTURE[1]

BY LEWIS MUMFORD
Architect

Less than a century ago, John Ruskin set everyone thinking freshly about architecture. He discovered that buildings were alive; every stone had a tongue, and every tongue could tell a story. Many of us are still living by the enthusiasm that Ruskin awakened. We look forward to a trip to Europe which will permit us to read for ourselves these histories in stone—Westminster Abbey, Winchester Cathedral, the Belfry of Bruges, Chartres, the remains of the Roman Colosseum, the great fragment of the Parthenon. Ruskin taught us to see beyond the mere "sight"; he showed that these buildings were the records of a community's life, its interests, its tastes, its economic organization, its social order, its religion.

But art did not "stop short with the cultivated court of the Empress Josephine." On the contrary, architecture is always with us, and a walk around the corner or across the fields will bring us face to face with it. What impression do the buildings that surround us make? Do they contribute, as Ruskin said architecture must, to our "mental health, power, and pleasure"? Or is this the sort of miracle that architecture could work only in the days when it built temples, baths, arcades, and gymnasia? The answer is that architecture is always having a conscious or an unconscious effect upon us. If we botch our buildings, crowd them together, or mistake their proper use, we cannot escape the results of our failure; if we plan them, order them, and design them with skill and love and sincerity, we shall, inevitably, participate in their triumph. Walt Whitman said that there were trees that seemed to drop a blessing when he passed under them. Our buildings are always having the same effect; sometimes

[1] Adapted from *Architecture*, pp. 9–13; American Library Association, "Reading with a Purpose," No. 23 (1926).

it is a blessing, sometimes a curse, sometimes a feeble, limp handshake, with scarcely life enough in it to be positively bad.

Ruskin's great insight into medieval culture had in one respect a bad effect upon our appreciation of architecture. He chose to call "architecture" only that part of building in which sculpture and painting were conspicuously used. Architecture, for him, did not exist without decoration. So a host of people now have the notion that architecture is something that is added to the building, with a flourish, when the practical work of building is done. In short, art is little more than the icing that is added to the cake. This is a great error. A building may be plastered with decoration and still be hideous or absurd; on the other hand, a structure may be as lean and stark as a corn elevator, and still have some of the massive grandeur of an Egyptian tomb.

The forces that change architecture from one style to another are new materials, new modes of construction, and the rise of new social habits, new modes of thinking and living. All these conditions affect the manner in which the architect marshals a building together; and the style of any period is the total result of these changes. It is as impossible to build in the Elizabethan style nowadays as it would be for Mr. Bernard Shaw to write the plays of Shakespeare. The tradition of using stone or glass may be carried over from one century to another, likewise a mode of construction, like the vault, the pointed arch, or the dome. For that matter, certain proportions, like the height of a column to its width, may become traditional. A style as a whole cannot be carried over, however, and to build "in a style" is to build something dead and uninteresting, because it is not related to the currents of our everyday life.

But do we not want beauty? Yes. And were not the buildings of the past undeniably beautiful? Yes; many of them were. Why, then, should we not bring them over to modern America? Why should we not have Roman courthouses, Gothic colleges, Greek banks, Renaissance office buildings, Tudor or Colonial cottages, or clever mixtures of all these examples?

Beauty, unfortunately, cannot be captured by taking refuge in a "style." Beauty is not something that can be aimed at directly: it is rather what follows when the architect's skill and taste and understanding are devoted to fulfilling the immediate purposes of a building. Each building has a purpose to express. Does it express it? Each building has a place to fill. Does it fill it? Is it made for its site? Can it be seen? Can it be

approached? Does it mingle decently with its neighbors? Each building has a function to serve. Does it serve it? Form and function, beauty and use, are coupled together in every excellent piece of architecture. Lacking one or another, a building is deformed. It is useless to deceive ourselves, or to hide our impotence, by trying to fit modern functions into old forms, or attempting to combine twentieth century "uses" with second century "beauties."

At the bottom, then, architecture is not "style" but building. . . . .

[NOTE.—". . . . The architecture of a city is therefore a matter of supreme moment to its welfare. If the architecture is ugly, it is impossible to keep the populace sensitive to beauty. It degrades and vitiates the aesthetic sense, and tends to deaden the nobler spiritual emotions that attend it. It adds to the misery, the stupidity, and the viciousness of people. If, on the other hand, the architecture is uniformly good, it tones the whole community life. Such is the uniform testimony from the 'model village' communities.

"Indeed, I think that we are not at all aware of the immense social asset that uniformly good architecture would be. Fancy a city in which all of the buildings are beautiful, and trace the influence on the lives of the inhabitants. In the first place, it would add greatly to the happiness of people, for, as has been observed, it is the normal function of beauty to make us happy. Unless we have allowed ourselves to become diseased, happiness will attend beauty as naturally as flowers turn to the sun" (Frederick M. Padelford, "The Civic Control of Architecture," *American Journal of Sociology*, July 1908, 45–46).]

THE USE OF MATERIALS IN ARCHITECTURE[1]

BY LEWIS MUMFORD
Architect

All the great architectural forms were bound up, in their origin, with certain materials; and they never completely escape this limitation. The quarry gives us stone, the mine metals, the forest wood, the river bottom mud, and seashells or limestone will give us lime to make plaster. Here are the chief elements in all construction. What are their possibilities?

We hew and build the stone into walls or pillars and span the uprights with a stone laid flat across. That is post-and-lintel construction. It is the key to the simple, dignified architecture of ancient Egypt and Greece; in its development it gives us the temple at Karnak and the Parthenon, with the repetition of columns, the carefully studied horizontal and vertical lines, the mathematical proportions. If the space between the columns

[1] *Ibid.*, pp. 13–22.

grows too wide for a single stone to span it, we must arrange a group of them together in an arch, so that one will hold the other in place; and if this load grows too heavy, we must reinforce the columns with buttresses, and balance thrust against thrust in a more complicated arrangement. When we push this mode of building to the limit, we have the fourteenth century French cathedral. As the shape of the building varies, we get characteristic ways of enclosing the roof—the flat roof, the dome, the gable. The form will depend largely upon the purpose of the building and the climatic conditions, to say nothing of the materials—wood, slate, copper, or thatch that may be at hand. A steep gabled roof is suitable, for instance, when the building must shed snow all winter, or a flat roof when, as in Palestine, the house-dweller at the end of a day climbs up to the roof to get the cool air of evening.

If stone gives one type of construction, mud gives another. Let us make big cubes of mud, dry them in the sun, and cement them together with wet mud to form a solid wall: this gives us the mud hut of the primitive Egyptian or the adobe house of New Mexico. Reduce the size of the cube, use clay, and bake it with fire in a kiln: it becomes a brick. The brick is a more flexible kind of stone, and, in the lowlands, where wood and stone are sometimes hard to find in the marshes or the grassy plains, and clay is plentiful, as in the neighborhood of Amsterdam or London, bricks will be the chief building material. If the clay is molded in a special form, hollow in the inside, and keyed so that it may be joined to another form, we call the stuff terra cotta: as such it is always used as a covering, for unlike brick it cannot stand up under a load.

There is still another important form of masonry. Make a wooden form to contain the foundations, the walls, and the horizontal supports of the structure, and pour into this form a mixture of cement and sand, reinforced with iron rods for greater strength. So built, the house becomes a single stone, bearing the shape of the original mold: the name of the construction is monolithic (single-stone) construction. The Romans knew the secret of this method and applied it in various ways, using bricks, for example, as the mold and concrete in the core. Their bridges, roads, amphitheaters are still standing. It has the strength and simplicity of stone; it has the flexibility of brick; it has a massiveness of its own; and, in addition, since concrete can be poured into a mold, it makes possible fresh external shapes, which may fit the inside of the building as the glove fits the hand. Ferro-concrete, finally, need not be confined to flat surfaces and right angles. Erich Mendelsohn, the German architect, has shown how it can be modeled in the mass, as the sculptor models clay.

Wood gives still another type of construction. It leads to frame construction; for, like steel, a relatively light piece of wood will carry a heavy load when placed on end. Bind the frame together, form a box, fill the intervening space with bark, and you have the Long House of the Iroquois Indian; cover it with bamboo and thatch, and you have the simple Japanese dwelling; make the timber a little more solid, to stand up against heavy storms, and fill in the walls with clay or mud-and-twigs, or with flint, or with brick, and you have the half-timber house of medieval France, England, and Germany. Cover over a similar form with clapboards, and you have one of the early forms of the American house.

The habit of building frame houses in America made the transition to steel, for the framing of tall buildings, fairly easy, except for architects who had been too thoroughly trained in the forms of pure masonry. In stone construction, each stone bears directly the load above it: take away a course of stones in the middle of the wall and the building topples. In frame construction, on the other hand, the load is distributed: no single part of the frame is essential, for the whole is knitted together: the wall ceases to be a support and becomes a curtain, and whereas a stone building could not possibly be lifted off its base and transported, it would be as easy to do this with a skyscraper as with a cottage, if we could have engines and rollers built on the same scale. Structurally, the building is complete when the frame has been put together. All other construction is merely to keep off the wind and the weather and to divide the interior space into suitable rooms.

Steel is an excellent material when height or a wide span is demanded. Its chief defects are that it rusts and conducts heat too easily; so it must be painted repeatedly to guard against the first danger, and, to prevent warping and buckling in a fire, it must be surrounded by a fire-proof, non-conducting material.

The dominance of steel in American urban architecture today is an exhibition of the way in which a technical achievement, the cheap manufacture of iron and structural steel, has worked hand in hand with a peculiar social situation—the concentration of a large part of the urban population in skyscrapers, for the sake of the rise in ground rents. Steel was in fact forced upon the architect by the business man. As a result, all but a handful of our high buildings bear the prime marks of their origin: they are rent-barracks, in which every detail is subordinated to the principal purpose of utilizing each last square foot of land, each possible cubic foot of enclosed air. Our skyscrapers are often as massive and powerful as a mountain; they are often, also, as unformed and as crude as a slag-heap.

These are the essential materials and forms. They are, for architecture, what words and letters are for language. Without them, there is no architecture. What use we put them to, however, depends upon the human purpose that the building must serve, the state of the arts, the taste and training of the builder, and all sorts of local matters like the site itself, the amount of sunlight available, the climate, and the very character of the earth in which the foundations must be sunk. Architecture is both the most human and the most earth-bound of the arts; and it reflects natural conditions and human characteristics in every phase of its development.

Now, each of these basic materials lends itself to a peculiar heightening of its effects, so as to give greater "health, power, and pleasure" to the beholder.

Consider the stone mason. The quarryman, who merely shapes the rough stone into a block has his mind filled, perhaps, with the legends of the church and the memories of the countryside in which he grew up. There comes a time when he is no longer content merely to hew the stone; he wants also to shape it and to leave on it the imprint of his imagination: with that he becomes a sculptor. In the medieval cathedrals, so easy was it for the stone mason to pass into sculpture that scarcely a single surface remains untouched by the sculptor's art: satires, histories, legends, chapters of the *Bible*—all these crystallized in the stones of the cathedral, to make it a more complete expression of what the medieval man valued and loved.

Henry Adams has described this process in great detail in his magnificent book on Mont Saint Michel and Chartres. The same taste and skill, however, were applied to the most modest burgher's house. What keeps modern work done "in Gothic" from being alive is the fact that the skill and education and religion, which made it possible for numerous men to work on a common design, without having every detail marked down in the draughting office, no longer exists; one could scarcely trust a Catholic, a Baptist, and an Atheist to work their several wills upon a single church, without a little guidance. The mason's art has become largely mechanical reproduction. If the architect wants fresh and significant sculpture, he must limit it to the work that may be done by a single artist. This is what Mr. Bertram Goodhue did in the building of the Nebraska State Capitol; it accounts for the relative success of its sculptural decoration.

Wood differs from stone in its decorative capacities. Wooden beams and posts must not be carved too freely, or they will lose strength, and wooden sheathing, like clapboards, can scarcely be carved at all. Trimming, turning in a lathe, staining, and painting are the chief decorative

resources of wood. These forms are common to the wooden buildings of Japan, the Alpine hut, and the American wooden cottage. Concrete, on the other hand, is a material that tends to present large unbroken surfaces, and they must either create their own texture and color, or be covered over, as the Romans so often covered their concrete, with a veneer of marble. Finally, as an offset to these bare surfaces concrete may be encrusted, at appropriate spots, with tile or mosaic, or the wide wall surface may be painted or stuccoed.

Bricks, on the other hand, instead of having a pattern applied to them, can form patterns of their own. By using the end or the side of the brick (the header or the stretcher as the mason says) in various combinations we may bond the material together to form a particular pattern and texture; at times the pattern may be an elaborate geometrical design, accentuated by bricks of different colors. The use of overburnt bricks may take away from the flat uniformity of surface; by jutting out the bricks at intervals a similar effect may be produced. In Holland, England, and Northern Italy there is a vast array of brickwork structures, whose decorative interest comes largely from this delicate self-ornamentation; and a good deal of the charm of Georgian architecture in brick is due not so much to the stereotyped classic details as to the quality and color of the brick surfaces.

Finally, steel and glass present new resources. Steel can be bent and laced together, for in general, only by casting will it take any other than its structural shape. The earlier builders in the seventies, who used steel, sought to mold it decoratively, as they did the girders in the oldest section of the Metropolitan Museum in New York. But the best steel work, that of the Eads Bridge in St. Louis or the train hall of the Pennsylvania Station in New York, for instance, does not attempt to achieve any other effect from steel than that which follows from its structural interlacing. As for glass, it must usually be applied or encrusted: within that limitation its range is almost infinite; and as the Exhibition of Decorative Art in Paris in 1925 showed, its possibilities are far from being exhausted.

2. Architectural Style[1]

CHARACTERISTICS OF ENGLISH STYLE[2]

By AYMAR EMBURY II
Architect

. . . . Most of the large houses in England which date from 1725 or later, and a very great proportion of the smaller houses in the cities or suburban English villages, were designed in the Renaissance or Classic styles, and in the latter part of the eighteenth century and the early part of the nineteenth century, English architecture can hardly be distinguished in certain of its phases from good American Colonial work, although most American houses were built of wood, while most of the English houses of the same period were built of brick. That this resemblance should have existed is by no means extraordinary; America was then in process of colonization, and then, as now, a large proportion of the American mechanics came from England, and, accustomed to English usages, naturally continued to build as they had been trained. Architects at that time were few and far between, and carpenters and masons were in most cases responsible for the design of American structures, while the few architects who were in active practice used English books and had acquired their knowledge of past work mainly from England. The similarity between English work during the reigns of the four Georges and the American work of the same period is so marked that many writers on architectural subjects have preferred to use the term "Georgian" for American work as well as for English of that time, in preference to the term "Colonial," the vernacular expression.

The architecture which we are accustomed to think of as English is not this English Georgian, but the English cottage work, which began to take its present form as early as the fifteenth century, and which has existed up to the present day without substantial change. It is pre-eminently a product of the soil, an art carried on, not by studious inquiry of architects into form, color, and texture, but rather one developed by artisans whose education was obtained entirely from local traditions. The processes used

[1] The characteristics of the various architectural styles in domestic architecture are discussed briefly. Most houses in America which are commonly classed as of English, or of Spanish, or of Italian or other styles merely have dominant characteristics of these styles. In fact, many houses are carelessly tagged English or Colonial or some other style when they are a hodgepodge of a number of styles or perhaps lack definite characteristics of any style whatsoever.

[2] Adapted from *The Livable House* (New York: Moffat, Yard & Co., 1917), pp. 58–68.

are always the simplest, the materials those at hand, and the forms those customarily adapted to the peculiar location in which the houses were built. . . . .

The plans of most English houses are unquestionably bad—how bad no one who has not studied the plans of even the capable modern architects can conceive; and there is case after case in English work recently constructed where the connection between the kitchen and the dining-room is across the main entrance hall of the house, or where the living-room must be traversed to reach the reception-room. Now it is probably not true that a good plan means a poor exterior, yet it is unquestionably true that the freedom with which the English treat their plans gives them a much greater opportunity to design in a picturesque way. They think nothing of stringing their houses out, room after room, without any hall connecting them, of placing the kitchens twenty-five to forty feet from the dining-rooms, and of reversing what we expect to be the order in which rooms are placed. Nor do they attempt to design rooms without jutting corners or of regular shapes, and in consequence they are enabled to treat their façades with a diversity of motives practically unheard of in American work, even where an attempt has been made to conform to English ideals.

Another factor which makes it difficult to design successfully in the English style is the difference between climatic conditions here and in England; and while this difference is by no means so marked as between this country and Italy, it is still considerable enough to have marked influence upon design. As in Italy, the porches or piazzas are practically absent from English work, and it is a very rare thing to see an English house which has a covered terrace in any way resembling our piazza. As in Italy, windows are usually much smaller than we find necessary here; in the first place, because in England artificial heating arrangements in the rural districts are poor and insufficient, so that large glass areas would make the rooms cold in winter; and also since their summers are by no means so hot as ours, they do not feel that large windows are at any time necessary. As stated in the next article, in the case of the Italian houses, a very important factor in the design of the façade is the size and the spacing of the windows, and our architects find it most difficult to convince their clients that an English house must have small windows to be truly successful. Now this is not because we wish to be archaeologically correct, but because the high quality of English design depends upon large plain wall surfaces, as well as upon broken and irregular plan, and with the typical American plan with rooms of simple shapes and of fixed

sizes and positions of openings it is next to impossible to secure the irregular outline of the English work. . . . .

The materials used in English work have also something to do with its picturesqueness; we are accustomed here to build a brick house, or a wood house, or a stucco house, making the whole house of wood, or brick, or stucco, and this is due somewhat to the growth of an American tradition dating from pre-Revolutionary times, although in the Dutch settlements around New York it was not infrequent to find stone, brick, stucco, and shingles used for wall coverings in the same small farm house. In England not only was it customary to use a variety of materials for different portions of the same house, but also to mix the materials in the same portion; as, for example, the familiar "half timber" construction, where brick and wood are used alternately, or where brick coigns are used in a stucco wall, stone coigns in a brick wall, or stone introduced into a stucco wall at angles, windows heads, etc. In some English houses we even find the whole façade a sort of checker board of two different materials, stone and brick in alternate squares, or chalk and black flint used in patterns, so that the large plain surfaces customary in English work become decorative mosaics. This playful and interesting treatment is almost entirely absent from our American houses. . . . .

CHARACTERISTICS OF ITALIAN STYLE[1]

By AYMAR EMBURY II
Architect

Taking up . . . . Italian, the style which is perhaps of all the most difficult to translate into terms suitable to the conditions existing throughout the North, East, and West of the United States, we find that in Italy the roofs are flat, the walls thick, and the windows small and deep set. Italy has been for two thousand years a country where buildings of practically every sort have been constructed of masonry, because the supply of wood on the Italian peninsula was exhausted at a very early date. The Italians, therefore, as early as the Roman times, sought to economize wood to the utmost possible extent, and the exterior walls, the floors, and the roof coverings were of masonry of some sort or another; the walls usually of stone, or, in the cheaper work, of stone covered with stucco; the floors of brick or of terra cotta, sometimes of cement, and the roofs covered with tile.

[1] *Ibid.*, pp. 48–52.

The use of small windows was probably due to two causes: the first, a desire for coolness in the summer time, which was obtained by constructing houses practically like cellars; the second, to the difficulty and the expense attending the construction of wide openings in masonry walls without steel. The use of large stones for lintels was of course common in the Roman period, but it seems to have been confined chiefly to the public buildings for either religious or civic purposes; and while it is true that some of the largest single stones ever quarried are found in buildings of the Roman epoch, it can be very readily understood that the expense of quarrying such stones by hand, and with implements of bronze or poorly tempered iron, was prohibitive for the dwelling house. These conditions continued throughout the Middle Ages, and only with the introduction of blasting powder was the quarrying of fairly large stones economically possible, but by this time the tradition of small openings was pretty firmly fixed. Of course large openings could be spanned by arches, but the construction of window frames for arched openings was difficult and consequently expensive, and arches themselves require skillful workmen, unless mortar of a high quality is used. So while arched openings are by no means uncommon in Italy, the typical Italian house has squareheaded window and door openings, the wall above them supported on lintels. The roofs were usually of slight pitch without usable space below them, because rooms immediately under the roof would have been impossible of occupancy in hot weather, and also because there was no necessity to shed snow or heavy rains.

These were the factors which influenced the development of the Italian style, and because in this country every one of them is different it can readily be understood that the use of Italian architecture is more or less of a tour de force, and a successful Italian house must either be very different in principle from its original or factors of comfort and convenience must be sacrificed, which of course will not, in the livable house, be the case.

WHAT MAKES COLONIAL—COLONIAL?[1]

When the Pilgrims first came to New England they did not build log cabins. Modern research shows that this form of construction was typical only of a later period—after the Revolution, when the first great pilgrimage Westward from the Alleghenies began.

Some palisado-houses were built by the first settlers. They were not unlike the English dwellings of Norman times, when growing trees or cut

[1] *Colonial Homes* (The Home Builder's Library, Architects' Small House Service Bureau, Inc., 1927).

logs planted upright were bent together until their tops met and then were covered with thatch, sod, brush and mud to form a rude shelter. It seems that sod huts and half-underground shanties also were used during those first bitter years at Plymouth.

Soon these crude forms were discarded. The next step was the single-story house of one or two rooms built of hewn or sawed lumber. This was

Fig. 12.—Typical New England Colonial style house with plans (Figs. 13–14) as it has been modified to meet present-day needs. The central urn over the doorway which made its appearance in the early Georgian period is used over and over in Colonial architecture. (Copyright—the Architects' Small House Service Bureau, Inc., House Plan 6-A-72.)

closely similar to the early forerunner of the English Cottage—for the Pilgrims were Englishmen and the England they had left was essentially medieval.

Their first framed house was a simple rectangle with steep gabled roof of thatch. It was heated by a single fireplace with a great beam across its opening, located at the end of a one-room house or in the center if there were two rooms. The chimney was of wood and clay, for bricks and mortar were scarce. The spaces between the studs in the walls were filled with sticks and clay.

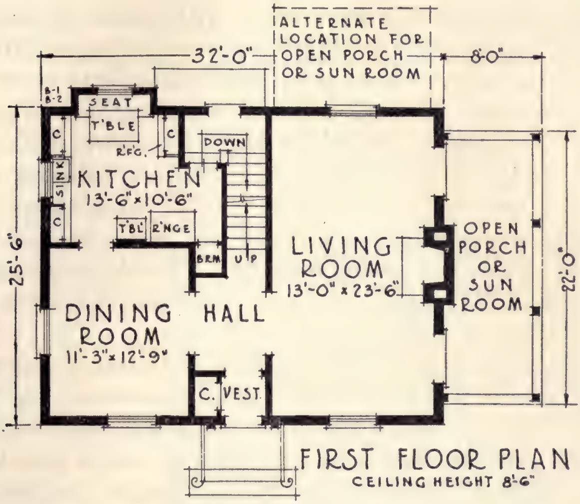

FIG. 13.—First-floor plan. Ceiling height, 8 feet 6 inches

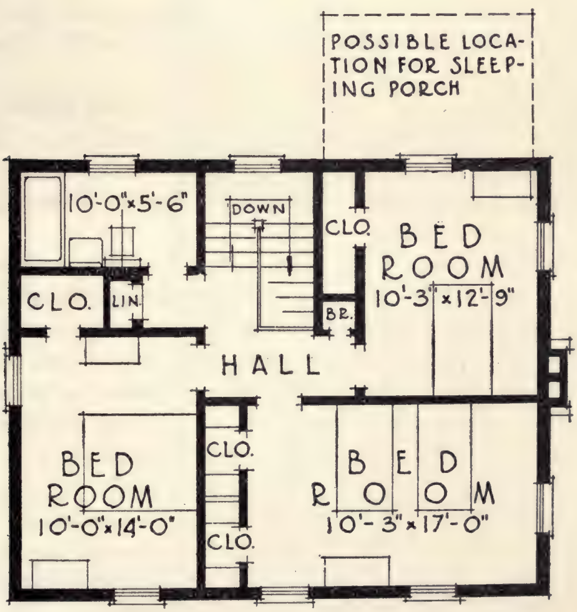

FIG. 14.—Second-floor plan. Ceiling height, 8 feet

On the inside this filling was covered with boards in vertical-panel effect. Light was supplied through sliding wooden frames covered with oiled paper. On the outside the house was sheathed with wood.

At first, hand-split "shakes," which resembled modern shingles except that they were longer, wider, thicker and more crudely fashioned, were used. But within a few decades the Colonists discarded these for siding-boards which were more economical and better in appearance. Several types of boards were employed, but gradually drop-siding such as we use today came into general acceptance, and this finish appears on many of the fine old Colonial houses which are the models for modern homes in this style.

Such was the basis of domestic architecture in the Northern United States. The second step was the addition of a second story and the laying out of two rooms downstairs and two above, with fireplace in the middle of the house or, in the finer dwellings, with one at each end. Where the owner could afford it the second story overhung the first and the first decorative element that appeared in these buildings was a plainly carved pendant or drop projecting downward from this overhang. Sometimes, too, a curved or flat arch appeared over the doorway, the door itself consisting of two thicknesses of wide boards diagonally studded with nails.

More room was obtained at first simply by tacking a lean-to onto the rear or end. This later was carried up to the second story. Gabled dormers were poked through the roof to make the upstairs chambers larger and lighter. But still there was no privacy—you'd have to go through one room to reach another.

So the hallway was developed. Its earliest form was an interior entry-vestibule called a porch. This was extended through the whole depth of the house and a short run of stairs with a winder at top and bottom was built in its rear. Gradually this was expanded into a hall-system intersecting both floors, affording seclusion to each room and giving the artisans a chance for beautiful work in the carving and turning of newels, balusters and stair-ends characteristic of the Colonial style.

From 1650 on, glass windows were common in the better homes. The glass had to be imported and large sheets were more expensive than small ones. So there were 24, 18 or 12 panes in each window, the common type being the hinged casement sash with leaded panes either diamond or oblong in shape. Gradually two or three sashes came to be grouped in the same opening, except in dormers, attics and gable-ends.

But this left the downstairs hall dark. Builders experimented with transoms and side-lights for nearly a century before the late-Colonial treatment—a fanlight with or without narrow side lights—was perfected.

By 1670 thatch had been generally discarded in favor of handsplit shingles. The first variation in the traditional gable was the flattening of its peak to form a gambrel or curb. Mansard, hipped and pediment-

FIG. 15.—Commonly termed English Georgian style. (Copyright—Architects' Small House Service Bureau, Inc., House Plan 6-F-10.)

gable designs later came into favor. And during the second and third decades of the XVIIIth Century, when modillion cornices and columned exterior porches began to be common, low balustrades appeared as ornaments on roof-decks.

Now, when the American home had reached this stage, it constituted a distinct architectural form, something which was different from any domestic architecture developed in the Old World. It embodied a character as simple, as dignified, as gaunt and unembellished, as practical, and as uncompromising as the characters of the men who created it. That is the New England Colonial style.

But it continued to change. Its two principal tendencies during the

XVIIIth Century were in refinement of detail and organization of design. The exterior porch with its Greek columns and pediment-gable is an example of the former. By organization of design is meant that comers and builders began to conceive of a house as a harmonious whole, not a single unit to which an addition could be tacked on at any place desired.

Ideas for both of these developments were borrowed chiefly from England and France, the sources of most of our domestic architecture.

THE DUTCH COLONIAL[1]

By H. SIMONS

.... Originally the type rose only a story-and-a-half, and the stories were low, too. There were four rooms on the ground floor, two on each side of a fairly narrow hall, and two big chambers upstairs. Extensions may have been added later to the ends and rear so as to provide a great kitchen, a dining room, a musty forbidding parlor, a store-room and one or two bedrooms downstairs and, if the householder were prosperous, four bedrooms above for his numerous children.

Its exterior need not necessarily be of brick or white siding. The Dutchmen about Sleepy Hollow built with whatever materials came to hand—stone, stucco, brick, big hand-split shingles called shakes, or boards. Some of the mellowest of the old examples of the style are of yellowish-brown or purple-red fieldstone. The stucco used there was greyish in color and rough in texture from being applied much as a modern plasterer works his material with a wood or a cork float. Frequently two or more materials were combined in the same house; it is not rare to find in the old Knickerbocker settlements a home with a stucco front, the back shingled, the ends of stone, one addition covered with clap-boards and another built of brick. So the modern copyist of this style may have all the variety he wishes and still be accurate.

THE DUTCH NEW YORKERS

It is incorrect to assume that the Dutch New Yorkers were monopolists of the curb or gambrel roof. They never built the high-peaked gables typical of early New England dwellings. At first they covered their homes with low, wide-spreading gable-roofs of single pitch. But when the double-pitched gambrel came into style in Massachusetts, Pennsylvania, Maryland and Virginia, it was adopted by the settlers in the Hudson Valley. There it continued in common, but timid use. When we say that they applied this roof-style timidly, we mean that the Dutch build-

[1] Adapted from "What Is a Dutch Colonial?" *Small Home*, January, 1926.

ers did not vary the angles of the upper and lower slopes much: The effect still was almost of flatness and the extra space provided for the second-story rooms was not great.

Then how were these rooms made light and airy? Imperfectly, if at all. Later generations of owners may have poked dormers through the roof. Many homes of the sons or grandsons of the first pioneers had a row of windows tucked in below the eaves. But in most of the old houses of this style all the light and ventilation for the upstairs were provided by tiny windows in the ends of the house and by not carrying the partitions of the rooms fully up to the ceiling so that a draft could move through the whole length of the house.

NONE REALLY DUTCH

How can the modern builder correct this severe defect? Only by using the services of a skilled and sensitive architect. There are four devices by means of which the Dutch Colonial style can be adapted to the hygienic demands of the modern American family: 1, recessed dormers; 2, a series of small projecting dormers; 3, one long shed-like dormer; 4, one or more secondary gables. None of these is really Dutch. Any of them is likely to break up the quiet effect of the low gambrel roof which is one of the happiest incidents of the style. So it takes more than a good builder to keep the adaptation from being merely a distortion.

Wide eaves with a slight curve upward are typical of this style. So, too, is the narrow piazza extending across the front or part of the front. But this should be supported by rather slender square wooden pillars instead of fat round ones. Small gabled or curved hoods over the entrances do not belong to the Dutch Colonial; they are features of the Pennsylvania Colonial type. But, even without this covering, the front door is one of the most charming single details in Hudson Valley architecture. It appears low and wide in comparison with modern millwork and it usually consists of an arrangement of inset wood panels of interesting size and design. Its lowness permits of a fan-light above and there are sidelights flanking the jambs, most often set between narrow, nicely moulded, wooden pilasters. Both the woodwork and the glass are simply treated; but there are unexpected graces in the carving and delightful niceties in the leaded glazing. A good effect of contrast is obtained by surrounding the dark-wood door and its sidelights with white woodwork.

Windows are treated more plainly. They never are placed in pairs but are spaced uniformly across the wall; their panes are small, as in all Colonial types, and they are hung with stout wooden shutters. Crescent, star-shaped or other odd-patterned saw-cuts appear in the upper halves

of the shutters, for this was another Dutch idea for ventilating and lighting the interior.

One more exterior detail we must notice—the chimneys. These never jut out from the walls, for the Hollander's fireplace was shallow. Nor do the chimneys invariably come through the roof-ridge. Occasionally they do so, but as likely as not they just happen through the roof without

FIG. 16.—Modification of Dutch Colonial house as commonly built to meet modern requirements. Although its double-pitched roof and dormer windows are characteristic of Dutch Colonial style, in the original Dutch Colonials the upper story windows appeared only in the ends of the house. (Copyright—Architects' Small House Service Bureau, Inc., House Plan 6-A-60.)

much relation to general design. They are plain square brick affairs, seldom hooded, but frequently showing good craftsmanship in their caps.

Low ceilings impart coziness and familiarity to the rooms. In most instances the rafters are exposed and the ceiling itself consists of the undersurface of the upstairs floor. The beams may or may not be painted, but the panels between them are likely to be white.

Walls in old Dutch houses are treated in three ways: With plaster, with wainscot and plastering or, but rarely, with floor-to-ceiling wood panels.

Perhaps the combination of wainscoting and plaster is the most representative, although many of the antique interiors show all-plaster walls with base-boards, chair-rails and cornices of wood. Writing of the famous Lady Moody house, one observer noticed, "The walls are covered with an exceedingly rough plaster, which would never pass inspection in a modern house, but which, because of its very roughness, helped to decorate the interior." Textured wall-treatments are in vogue again now, and here is ample warrant for their incorporation in the Dutch Colonial style.

Tiling is found here more rarely than might be expected. Rarely a floor, less seldom a hearth, of square red blocks appears, and some fireplaces are faced with Delft tile. But usually the mantel is a veneer of finely designed wood carving imposed over the big bricks of the fireplace and forming a narrow shelf more than halfway up to the ceiling. Floors generally are of wood. Recessed windows with window-seats are common. Cross-corner closets with glass doors and shallow cupboards for the display of china and pewter are typical old-fashioned touches. Generally speaking, the wood-working shown in the old Dutch house is exceptional for its workmanship and its fine proportions. For the rest, there are few differences between the Dutch Colonial house and other American dwellings of the same period.

THE EVOLUTION OF THE SPANISH HOUSE[1]

By REXFORD NEWCOMB
Professor of History of Architecture,
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That variety of architecture which the world knows as "Spanish" goes back in history a good many centuries. Indeed the beginnings that gave rise to architectural expression in Spain were similar in character to those which gave rise to building endeavors in other sun-lit lands of the Mediterranean area. It is no "historic accident" that the Assyrian palace, the Greek house, the Roman villa, and the Spanish residence were all disposed around an open court. This similarity in plan, if not of detail or of decoration, is mute testimony of the influence of climate—the heat of the sun—in these favored lands around the Classic Mediterranean. Thus the primitive impulse to produce an artificial shelter from the sun has operated to give to all Mediterranean architecture a character the like of which the world has witnessed in no other area.

[1] Adapted from *The Spanish House for America* (Philadelphia: J. B. Lippincott Co., 1927), pp. 13–24.

Each of the early Mediterranean peoples developed a type of house best suited to its own needs, and this long before any similar expression in the Iberic peninsula—Spain—had time to evolve. Thus, by the time that ships and navigation made possible the migration of peoples and the exchange of ideas, Egypt, Babylonia, Assyria, Greece, and Rome had acquired civilized traits and an artistic prowess worth passing on to their less-advanced brothers of the Mediterranean basin. The salient message of all Mediterranean architecture is its reaction to climate, its essential sunniness, its emphasis of light and shade. This quality is apparent in its every line, be it plan, elevation, roof, or decoration.

The Spanish peninsula remained in the hands of the primitive Iberic race until a time relatively late in history and was thus a virgin field at the time when the Romans were ready to conquer the western Mediterranean. With Roman domination came Roman institutions, Roman law, the Latin tongue, and the acquired Roman art, itself the appropriated heritage of Classic Greece and ancient Etruria. Spanish art—and particularly Spanish architecture—is therefore of assured Roman origin, round-arched, rhythmic, and sun-loving, subsequent events introducing other wonderfully interesting features.

Thus to-day Spain offers us an architecture the versatility of which is perhaps matched in no other European country. Here we find fragments of an ancient Iberic art; a wealth of Roman remains; bits, particularly in the northwest, of Christian Visigothic architecture; at Toledo and in the sunny cities of Andalusia, a wealth of Moorish handiwork; in many of the important episcopal cities impressive Gothic piles, which in turn were preceded by the forerunning Cluniac-Romanesque introduced from France; and everywhere the record of the splendid, if exuberant, Renaissance that followed hard upon the "Gothic of the Catholic kings," the indelible evidence of a national rejoicing over the final triumph of the Spanish cross at Granada and of the Spanish sword in newly-discovered Peru and Mexico.

The type of house which emerged from the vicissitudes of Spanish history is one eminently adapted to life in sunny lands and, like the town houses of Greece and Rome, it turns a relatively "bleak and bare" *fachada* (face) to the street, reserving its greatest interest and most joyous aspects for the interior, and particularly for the patio, which becomes in the heat of summer, and during the sunny hours of the whole year, an outdoor living room. This, then, is the whole spirit of the type of house that, with the conquering of the New World, was introduced into the Indies, South America, Mexico, and the Spanish areas of our own country.

In each of these lands this type of house, evolved to meet the demands of life in the home land, was exposed to a whole new set of environments. As a result it took on various forms in the various colonies, showing here a roof of deep-red tiles, there no visible roof at all, here a tile-plated and colourful *fachada*, there the sparkling texture of whitewashed adobe (sun-dried clay) plaster, here the time-honoured, round, rhythmic Roman forms, there the inevitable influence of Aztec or Pueblo Indian handicraft.

Thus, while preserving its general sunny quality, the Spanish house in the New World took on characteristics and evolved new details which, while generally Hispanic in feeling, had only remote precedent in Spain and in some cases no prototype at all. But this is only to be expected, for any art that is alive responds to the demands and absorbs the character of the race or the age that it serves. With the infiltration of ideas from the splendid pre-Spanish Aztec culture, the Spanish house in Mexico took on a decidedly Mexican character. Moreover, the wealth of the country and the development of the tile industry at Puebla and other cities made possible a lavish exterior use of colourful wall tiles, a material which in Spain was more generally reserved for the cool interiors, patios and gardens. Thus, while domestic architecture in Mexico sacrificed much of the old Spanish precision, finesse, and delicacy, it gained much in freshness, spontaneity and naïveté.

This Spanish-Mexican house was eventually carried by the colonizing *conquistadors* into California, Arizona, and New Mexico, into Texas and the Gulf Coast, and into Florida. In each of these colonies, more or less isolated at the time, was developed a local variant of the Spanish-Mexican type, which, as time went on, differed as much from the others as from its prototypes in Mexico.

In California the settlement of the country by the monks of the Franciscan Order and the architectural forms which these priests and their Indian charges reared exerted an unmistakable influence upon domestic architecture. Moreover, the remoteness from Mexico and the corresponding scarcity of competent artisans, together with the enforced employment of the crudest of materials, led to an extreme simplification of forms and an utter minimization of detail. This was perhaps no handicap in a wonderfully clear and vibrant atmosphere, such as California enjoys, and this very simplification of forms, in contrast to the exuberance and lavishness which is everywhere so pronounced in Mexico, serves to give early Californian domestic architecture its frugal, honest, and craftsmanlike character.

Without much in the way of ornament and the employment of only the

simplest of structural expedients, Californian architecture had of necessity to pay large attention to the proportion and form of these few expedients, if beauty were to be accomplished. The fundamental simplicity and well-proportioned masses of the old houses at San Diego, Santa Barbara, Los Angeles, and Monterey constitute valuable object-lessons to those of us who seek beauty of pure form unaided by the cloying sweetness of lavish detail. While most of the important Californian houses retained their arrangement around an enclosed patio, the treatment of the surrounding arcades of that patio became simple in the extreme. Here, however, due to the manufacturing prowess of the mission fathers, good roofing tiles were available and almost invariably Californian houses and all their appendages were covered with ruddy "Mission" tiles.

The "desert" situation of Arizona, on the other hand, and the proximity of Arizona to Sonora, served to ally the architectural expressions of these two provinces and to give to them a certain "desert" quality which recalls, perhaps more forcefully than anything else to be encountered in America, the desert forms of Moorish North Africa. Here the roofs, always a "crowning glory" in California, become flat and refuse to figure in the perspective.

The Spanish houses of New Mexico vary from their prototypes in Mexico and Spain more than any other of the Spanish Colonial types. When the Spaniards conquered New Mexico they found a sedentary Indian population, already living in cities, who had developed an appropriate native architecture. Therefore, when the *conquistadors* employed the native artisans to build houses, there resulted a new type of house, half-Spanish, half-Indian, entirely unlike anything developed in other Spanish colonies.

The New Mexican houses, while typically Spanish in plan, were just as typically Indian in mass and outline. The general forms resemble the terraced Pueblo Indian houses, building up into picturesque, natural masses. But while the pure Pueblo houses were terraced to several floors, the New Mexican Spanish types remained uniformly low and never exceeded two stories. The great charm of this type is found in the interesting way in which it reflects the natural geologic forms of its environment, its almost invariably good proportions, and its picturesque flowing lines.

The "flowing" quality of line which asserts itself not only in the elevations but also in the plans of the older New Mexican types probably came about through the Indian's appreciation of nature's disregard for right lines. He therefore shows no respect for them nor for mathematical right angles. Thus his plans, as well as his masses, show many pleasant little

inexactnesses which impart to the house a quality of life that no mathematically accurate structure can possibly have. There is a human friendliness in these houses, the rounded and softened lines of which were stroked into place by the bare palms of the Indian masons who were called in to execute them.

Our notions of Texan domestic architecture of the Hispanic period come to us largely through an examination of the habitations erected in connection with the Franciscan missions in and around San Antonio. Here the building materials varied from adobe bricks to random-rubble stonework. It is to be noted that many of the apartments in the mission houses, like the mission churches themselves, were crowned by tunnel vaults of masonry. Like the Arizona types, architectural forms here partook of a "desert" quality as charming as it is rare in America.

Saint Augustine, with its old houses, city gates, plaza, and fort, serves to give us our main information regarding early Spanish architecture in Florida. The projecting balconies and tinted stucco of the houses, the "tropical," as opposed to the "desert" feeling experienced in so much of our southwestern Hispanic work, high walls of stone festoons of Spanish moss, lolling wind-blown palm trees, varicoloured awnings, the glint of a wrought-iron gate or grille, low-lying strands of sand, blue-green or saffron-coloured shutters: these are some of the elements that go to make up the picture.

And thus it is wherever we seek the handiwork of the Spanish artisan, in America or in Spain, his forms are always conceived with regard to the contrasts afforded by brilliant sunlight or deep shadow. This then is the message of Spain's architecture, and he who would build in this fascinating vogue must appreciate and abide by the ruling spirit of this sun-begotten style.

WHAT MAKES SPANISH—SPANISH?[1]

Terrific heat, a burnt and barren landscape, and insects make it impossible to enjoy nature out-of-doors in most parts of Spain. So the Spaniards try to bring nature inside the house.

This they do by means of the patio, the little rectangular courtyard or garden that forms the center of the home. In it a few shade trees are rooted in the ground or are set in tubs. A tiny fountain is in the center and little streams trickle out of it to the various garden patches. These are laid out in geometrical pattern with walks of brick, tile or gravel between. Iron or stone benches (concrete would do) are placed in shady nooks.

[1] From *Spanish-Italian Homes* ("Home Builders' Library," No. 5; Architects' Small House Service Bureau, Inc., 1927), pp. 1–2.

We in this country need not hoard nature in this careful way. But any house in the Spanish style may have at least a high wall of brick, stucco or whitewashed wood, enclosing a small formal garden and giving a feeling of seclusion.

The Spanish house is built around the patio. On three or four sides of it, facing the garden, is an open arcade on the ground-floor with a deep balcony above. The columns holding up the balcony and the smaller ones supporting the roof may be round, or square, of stone or brick, plain or sheathed with stucco. The wide arches between them may be of plain stucco or stone.

While the balcony overhead is usually plain, the arcade on the ground-floor is one of the most beautiful parts of the Spanish house. Its floor is of stone, brick or tile. Concrete or flagstones may be used, but some color is desirable. One of the most beautiful effects may be obtained by wainscoting the wall with glazed tile.

Here the owner's love for color may have full expression, for the glazed tile was brought to Spain by the Mohammedan invaders from North Africa. Their religion prevented the use of human or animal forms in any design; so their tile were "arabesque" patterns of blue, yellow, vermilion, earth-red, black, green and other colors. Above this wainscot band the wall and ceiling of the arcade are plastered or stuccoed with a palm-finished surface. The doorways may be plain openings in the thick walls or they may be surrounded by bands of tile.

There is at least one entrance to the patio on each side. All these are from various rooms, except one which leads through a hall to the street-door.

The roof is as near flat as the local rain- and snow-fall will permit. It is of terra cotta tile, varied in color. Its eaves—those overhanging the balcony of the patio, as well as those on the exterior—are wide, with the wooden roof-beams exposed.

Walls are thick, built of brick or small stone and covered, in forty-nine cases out of fifty, with stucco. This may be white, cream, buff or pink and should be rough with a palm-finished surface. Because of the Spaniard's secretive character, he made no attempt to beautify the exterior of his home, but concentrated the decoration inside.

Windows are tiny openings in the thick walls. They may be round, square or oblong. Usually they have no trim at all, though sometimes they are surrounded by stone and often they are shuttered or barred with iron. There is only one street door. It, too, is usually quite plain—a

heavy, studded plank affair hung in a deep wall-opening—but sometimes it is surrounded by heavy slabs of stone which may be sculptured.

Few Americans would care to present a house-front as severe as this to the world. To make it more charming, an iron lantern may be fastened over the entrance. Or the window-bars may be developed into grilles. Or the second-story windows may be enlarged into doors opening out onto little iron-work balconies.

Now, as to the rooms. They are low and lighted principally from the garden side. Each one is a simple rectangle in shape, opening into the two

FIG. 17.—Adapted from Spanish-style architecture with characteristic stucco finish, tile roof, and patio. (Copyright—Architects' Small House Service Bureau, Inc., House Plan 5-B-30.)

rooms on either side of it. It will be noticed that until now very little has been said about wood. The truth is that the Spaniards used little exposed wood in either the exteriors or the interiors of their homes.

Floors are of tile, usually red or black. Walls are rough-plastered and present large surfaces which may be partly covered with cloth or leather hangings. Fireplaces are rather plainly treated. Doorways between rooms may be either arched or square-topped, without decorative treatment or surrounded by glazed tile. One of the most charming details may be the stairways, in which the risers are faced with coloured tile while the treads are of wood.

Spanish interiors are not cluttered up with knick-knacks. Their feeling is of substantial usefulness. The Spaniard's house keeps closely to his needs, and in adapting the style to modern American living conditions the owner and designer will do best if they follow that principle rather than straining for picturesqueness.

THE USE OF STYLE IN ARCHITECTURE OF TODAY[1]

By R. W. SEXTON

For many years it has been the custom of architects in this country in solving their modern problems of design to seek inspiration (to put it mildly) from the styles and periods of the past. During the last ten or fifteen years the practice has been carried to extremes. Our architects have not only designed in the style of five or six centuries ago, but frankly allowed their efforts to be labeled with a tag bearing the inscription, "Designed in the style of the Romanesque," "the early English," or "the Spanish," as the case might be. The public generally took to this idea; it seemed to give a building a certain distinction if it could be associated with some historic style. Real-estate operators were quick to recognize the sales value of a house with a "period label," and owners of all kinds of buildings, including house owners, fell in line with the demand for period designs.

The result was that if a house did not bear sufficient evidence in its design of the influence of some one period to allow the owner to apply to it the name of one of the old historic styles, that house was considered of poor design and lacking in architectural value. It can readily be seen that progress in architecture in this country was seriously handicapped by this custom. The question of style overshadowed all else, individuality being entirely lost sight of.

But the practice was not without benefit. Believing that to be versed in architecture only an acquaintance with the styles and periods was necessary, the public immediately began reading up on architectural history. Now, although one cannot by mere reading master the art of architecture, it is true that a real appreciation of beauty in architecture was developed almost overnight.

But the unfortunate part of it is that now, in line with the present-day tendencies in standardization and mass thinking, we are attempting to

[1] Adapted from "The House of To-Day," *House Beautiful*, June, 1930. Reprinted by permission from the *House Beautiful* magazine.

standardize beauty in architecture by means of the perpetuation of the old styles and periods. Thus it has come about that the styles and periods have exerted a tremendous influence on the design of our houses during the last decade or more, and still do to-day. In fact many architects believe that they always will. G. Edwin Brumbaugh, a Philadelphia architect, has expressed the opinion that, as houses are ideally the intimate expression of the owners' education and culture, it is difficult to disassociate them entirely from the history of art. He himself feels that an entirely new art, with no trace of the romance of history, would not con-

FIG. 18.—Interesting architectural treatment is shown in this Santa Barbara house which won a prize in a local architectural competition.

tinue to satisfy him day in and day out. Arthur C. Holden, an architect of New York, believes that because home surroundings and habits of life are deeply intertwined with the traditions of the family, anything which appears to sever these roots is apt to be looked upon as questionably radical, and therefore not desirable.

It is very evident that the architects are unanimous in the opinion that the period idea has been carried too far. They do not advocate turning our backs on precedent and tradition and the history of art, but they are aware that it is far more important that the design of a house be in good proportion, that it be appropriate to its site, and that it reflect the individuality of the owner, than that it merely conform to the character of

any one of the historic styles. They still seek inspiration in the past, but instead of being slavishly imitative they are learning to be interpretative. Frank J. Forster, an architect who specializes in domestic architecture, points out that the circular tower on one of his recent houses was inspired by one on an old French farmhouse and that the oriel window portrays strikingly the influence of an early English manor house. An architect, I claim, must be possessed with originality and creative ability so to interpret these old motives that they become a harmonious part of his own composition.

But there are those who still cling to a period appellation. Mr. Forster admits that he found it difficult to label this house to the client's satisfaction. Actually it is a modern house, because it expresses the ideas of a twentieth-century architect and is adapted to twentieth-century needs. Admittedly there are French and English influences in certain details, but they are minor elements in the design. Is it not in reality more distinctive to describe a house as "of stone," "in the woods," "on the side of a hill," and so on, than to revert to such a stereotyped description as "a house designed in the Early English style"? Described in the former terms, the imagination is aroused, but with the latter nomenclature you are led merely to open your style book to page, say, 88, entitled "Early English," and your interest ends there.

These more important considerations, therefore, of material and adaptation to site are the ones that are being emphasized more and more. . . . . When our architect talks to us in terms of stone, brick, stucco, or wood, we really can follow him more easily than when he refers to styles and periods. It requires only a sense of the fitness of things to understand him when he says that on a woody site, such as ours, a brick house would look out of place; and we comprehend him immediately when he states that a formal house would not be suitable for our lot on the side of a hill.

Thus as we free ourselves from the constraint of period design, we learn that design is best developed from the plan, and not contrariwise, as has been too often the case in the past. For when we logically work out our floor plan, first to meet our needs and serve our requirements and to conform to the contour of the land, and then from it develop a design that shall reflect our personal tastes and harmonize with the natural landscape, we find that this design bears but slight resemblance to the architecture of the old styles and periods. The fact that so much of the countryside of Northeastern America is characterized by irregularity of contour leads us toward more informality in house design than was evident in the days

when period architecture flourished. This tendency is seen, too, in the fact that so many architects report that their clients prefer stone to all other materials. For with stone is associated most commonly a low rambling house, rugged in its details, in which the relation of house to site is strongly accented.

It is probably true that Colonial architecture is still the inspiration for the greater part of domestic architecture in all sections of this country to-day. I attribute this to the fact that, as we grow older as a nation, we recognize in the Colonial many of the traditions which the early history of this country records. In other words, we think of it as preëminently American. Then, too, Colonial architecture may reflect English, Spanish, French, or Dutch ancestry without detracting from its Americanism. We find the Colonial of New England quite different from that of Pennsylvania, and the Colonial of Virginia and the Carolinas bears little resemblance to that of California. But each suggests the traditions associated with Colonial days of American history in its locality. . . . .

Another reason for the popularity of the Colonial is the fact that this style is not exclusively identified with any one material. There are old Colonial houses of stone, brick, wood, and even cement. Hence the house owner may build his house in his favorite material and still cast it in the Colonial mould.

What of the future trends? Do we see another style dominating as the Colonial does to-day? For there are some people who are convinced that fashion is based on a cycle, claiming that it is fashion which dictates at any given time the popularity of one style of architecture over all others.

I take a rather different stand. I believe that once we have shaken off European influence it will never return. Now that we have drawn away from a purely superficial conception of period architecture, we are reverting to tradition for the best that it can furnish us in the interpretation of function and setting. Our domestic architecture will continue to bear a certain resemblance, not to any one style, but to many styles, for some time to come. But it will sparkle with original ideas as it has never done before. New materials will allow new forms, and old materials will be found to lend themselves to a new manner of expression.

And what of the house in the "modern style"? Perhaps, as Mr. Brumbaugh says, after we get thoroughly accustomed to the new manner of design which is seen in shops and office buildings, the modern style, as we choose to call it, can be extended generally to apartments and finally to

houses. But it looks like a hard pull. However, I foresee a distinctive American style of domestic architecture which I believe is now in the making. Just when it will materialize, I, of course, cannot predict. It depends upon how soon we come to understand that architecture is much more than a book of styles or patterns from which each owner selects the design he likes best. We shall then realize that a house may be well designed even though it cannot be described as being in the style of any one of the historic periods. And we shall then appreciate the fact that a house, though bearing evidence of the influence of the past, may still be truly modern because the individuality of its twentieth-century owner has been reflected in a design created by a twentieth-century architect.

THE FUTURE OF MODERNISM

The architects of the country seem to be divided in their opinion of the lasting influence of modernism in architecture. However, Thomas E. Tallmadge, in his article "Will This Modernism Last?"[1] states:

> This modern art, already established in our skyscrapers, will in my opinion soon affect the design of our homes. Pretty soon some distinguished architect will build in the modern manner a distinguished house for a distinguished client. . . . . It will give courage, with its *cachet* of authority, to many a timid client and impatient architect, and a flood of houses in the same manner will follow. Thus will this modernism become fashionable and so established in the well-fortified realm of domestic architecture.
>
> . . . . In the first place, the thirty-year duration of an architectural fashion is spent, if we agree that our present period of eclecticism began with the World's Fair in 1893, and in the second place the great half-millennial cycle of the Renaissance era has also reached its close.
>
> There are other more practical and sensible reasons. Architects and designers are sick and tired of the Renaissance and the other historic styles. Bertram Goodhue, the idol of the drafting-room, shortly before his death abandoned the Gothic and embraced the new faith. Hood, Corbett, Holabird, Walker, brilliant young luminaries in the architectural galaxy and all of them Beaux Arts men, seem to be converts. The development of new materials, particularly steel and reënforced concrete, demands new forms of expression. The automobile, the aeroplane, the radio, the cinema, have changed the tenor of our lives, and have brought in their train demands for new and strange buildings.

Ralph Adams Cram in an article by the same title[2] believes that the modernism will not last in itself but that it will leave an influence for good.

[1] In *House Beautiful*, January, 1929.

[2] In *ibid.* Reprinted by permission from *House Beautiful* magazine.

A number of architects have shown unrestricted expression in house design and although these most unique developments have not become common to any locality they undoubtedly show new possibilities in both planning and equipment.

The "Dymaxion House" model, planned by R. Buckminster Fuller, has been designed to show the possibilities of mechanics. This project represents three years of study. It is a large octagonal affair built on a mast.

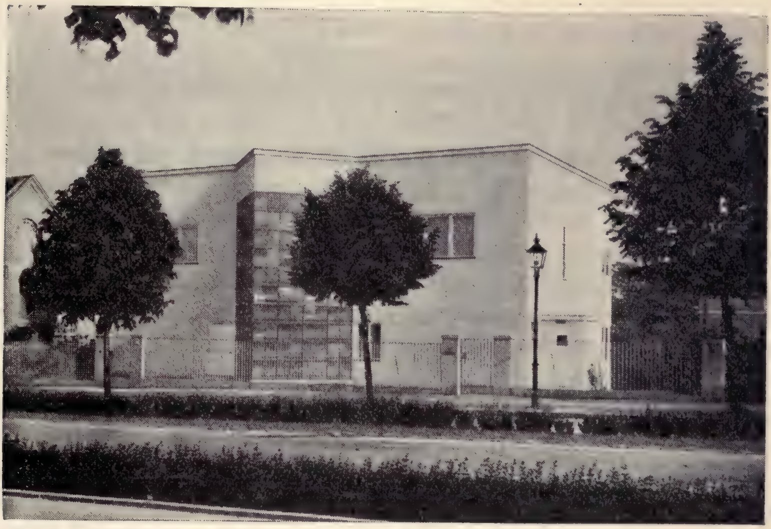

FIG. 19.—An example of modern architecture in Berlin, Germany. The triangular window space provides for ample sun and light. (Photograph by courtesy of Copper & Brass Research Association.)

The outside walls are hollow, triangular panes of casein. The doors are inflated and roll up when a button is pressed. The air is filtered of dust and odors and always properly heated and humidified. The floors are also inflated. Mechanical devices reduce housework to a few minutes a day. The various decks are connected with an elevator running through the mast. The first story is a combination garage and hangar. The second story provides for the living quarters and the top deck for recreation and play. The idea of the project is to develop a factory-made house, which will cost only three or four thousand dollars and which may be installed within a few hours.[1]

[1] For further information on the "Dymaxion House" see *Housing*, March, 1930.

Houses which move on axes to allow sunshine to enter all rooms have been erected in some parts of the country. In Germany a spherical sunlight house set up on concrete posts twenty or more feet above the ground has been erected. The designer believes that in addition to a maximum amount of sunlight and unobstructed view such houses will allow for much wider streets.

3. Design of Small Houses

PRESENT-DAY SMALL-HOUSE ARCHITECTURE[1]

By JAMES S. TAYLOR
Chief of the Division of Building and Housing,
U.S. Department of Commerce

American domestic architecture is on the mend. The more expensive houses are usually designed by architects who specialize in that kind of work, and are acknowledged to be the best in the world. More operative builders appreciate the importance of good architectural service and employ architects on their staff or as consultants. By means of deed restrictions and other forms of control or influence, they obtain architectural harmony in neighborhoods. The Architects' Small House Service Bureau, with its regional divisions, an offshot of the American Institute of Architects, has done a great deal to set higher standards in the small house field. Its work, together with that of material manufacturers and some of the commercial plan services, has interested more architects in the design of small houses, a specialty in itself, and this has all been encouraged by the wider publication and use of stock plans. Building trade papers, and home-building periodicals, which have had a striking increase in circulation during the past few years, and the home-building pages of newspapers, have done much splendid work in encouraging interest in good design, and in cultivating public taste. Fine work has been done also by various local groups such as the Community Arts Association in Santa Barbara, and the bodies which encourage adherence to historic traditions in some eastern towns.

Particular styles come, and have their vogue, and give way to others, in the construction of new houses in various cities. English and pseudo-English houses, and steeper roof slopes than formerly are now popular in many parts of the country, but many southern and western cities favor Spanish and Italian types.

[1] Adapted from "New Trends in Home Design" (address before Homebuilders' and Subdividers' Section, National Association of Real Estate Boards, June 26, 1929).

Probably more small houses of good architecture are being put up now than for a century past. In a desire to please prospective owners, efforts to present something out of the ordinary have been directed more towards adaptations of historic and provincial styles than to the pure exercise of the imagination which produced the so-called gingerbread ornamentation and other features of our lamented architectural dark ages, which still cast their shadows among us.

The small builder's organization is likely to be weak on the matter of design. We asked a prominent subdivider whose developments are noted for their good appearance how he got around this.[1] He pointed out that "control of the color, general type of the house, and its height above the grade line of the property and its relation to the adjoining houses is almost as important as good design. The effect of the treatment of the kitchen door on adjoining properties; the effect of the height of side terrace and lawn on adjoining homes, and the effect of some particular design upon the already-established design of other houses in the block all should be given consideration. We have had considerable difficulty in the hideous combinations of colors and particularly roof colors of various types of manufactured materials. There are a lot of fundamental things such as trying to group together homes of fairly comparative costs, keeping bungalows out of two-story house districts and two-story houses out of bungalow districts which all has an effect on the general appearance of the neighborhood. Also even if the houses are well designed there are always certain types that are more adaptable to certain topography than other types. Also frontages of houses on corner lots may seriously injure adjoining houses. We always try on corner lots to require the house to present a good front on both streets and give particular consideration to the effect of any design or arrangement of the house as to entrances, kitchen door, garage doors, etc., on the surrounding lots or houses."

Some of these things are matters that can be covered by rules laid down in writing in deed restrictions. The same developer also tries to set a good example. "In our own property," he states, "we have endeavored to encourage good design by building houses of all sizes ourselves as a standard, hoping in this way to force the other builders into good design in order to compete with us. I must admit that the public as a whole is generally not very discriminating as to design and the builder of houses that are bad architecturally frequently finds he can sell his homes as

[1] Mr. Taylor refers here to a study made of small houses by The Division of Building and Housing, U.S. Department of Commerce.

rapidly as well-designed houses. This enters into the whole question of improvement in public taste in general, which is a long slow process."

Beyond that he states: "I think the main difficulty in small houses is due to the fact that many builders do not employ an architect but simply build from their own plans or from sketches prepared by their boss carpenters. We have greatly improved the situation by encouraging the use of architects and have been able as a rule to show builders in our district that a good architect will not increase their cost but will get a better looking house, frequently eliminating unnecessary ornamentation, depending more on good lines. In some instances with such builders we had to volunteer them architectural services with their first few houses in order to convince them of this. We retain the approval of the plans of all houses, large or small, and really go to considerable expense, having our own architectural department check these plans and make suggestions. I realize that such a method is not very practical for developers of subdivisions who do not have their own architectural staff. Many of these subdividers would not be competent to pass on plans and would probably not want to go to the expense of having an architect pass on them. The whole matter is largely an educational one."

Other outstanding subdividers use the same method, or employ outside architects to pass upon all plans for homes in their subdivisions. In other places architectural juries are set up. In some cases, the men on them are merely residents whose architectural judgment is not likely to be of high caliber, and in others there is sometimes complaint that the suggestions of the architects who are members are too costly to carry out. The whole situation is gradually working toward a point where more and more architects are becoming qualified to render consulting architectural service in connection with small houses, whether as full time members of a staff, or on a free basis. . . . .

ARCHITECTURAL DESIGN AND SOUND CONSTRUCTION[1]

By JAMES FORD

Executive Director, Better Homes in America, Inc.

This article concerns four propositions: First, that most of the houses which are still being built in America are needlessly inconvenient and ugly and that there is great waste from too rapid depreciation; second, that convenience, comfort and beauty actually pay the owner in dollars

[1] In *American Building Association News*, March, 1929.

and cents, as well as in happiness; third, that soundness of construction is of importance both to the home-owner and to the community, and fourth, that builders and home-owners can and should be better informed than they now are on the principles of architectural design and construction.

It does not require a trans-continental trip or a training in art to convince one that a large proportion of the houses built during the last half century are either uninteresting or actually hideous from the architectural point of view. The good taste displayed by our colonial ancestors in the building of their own homes has made the American Colonial styles of architecture famous throughout the world for their good proportions, simplicity, and dignity. These homes were also built so well that when well located they command high prices today, after two or three centuries of use.

But in the nineteenth century especially, standards of architectural design fell off. The more pretentious houses carried too much ornamentation or "gingerbread," and the less pretentious homes were like dry goods boxes—just four sides and a roof, homely rather than home-like, and often positively ugly. Ordinarily these houses did not have the advantage of an architect's services, but were designed as well as constructed by the builder. Now and then one comes across whole villages in which every third or fourth house displays the handiwork of the same man, who perhaps built a hexagonal tower on top of each box-like house or ornamented his porches, dormers or gables in some peculiar manner. Such houses seem as out of place today as bustles and mutton-leg sleeves. Yet, though we can change our fashions in clothes rapidly and make them over or consign them to the attic or to "charity," old houses are not so easily disposed of, and remain to spoil our landscapes and to depress community values.

A peculiar feature of difficulty is the narrow lot so characteristic of American cities and their suburbs. It is almost impossible to build a beautiful detached house on a lot that is only 25 feet wide and still allow ample light and air at the sides. One essential principle of architectural beauty is that the width of a house shall be greater than its height, for only in this way will it fit in with the horizon line in a way that will please the eye. But on the narrow lot the height almost inevitably exceeds the width, and a street of such houses looks like a row of irregular teeth which need the attention of a dentist.

As rural builders are apt to make use of the types of architecture which are fashionable in cities, high narrow houses have been built all over the farm districts of the western states, even though they cannot be justified

by the excuse that the lot is narrow and that land is dear. When well sheltered by trees such houses may, of course, be very homelike and attractive, but it is much more difficult for nature to hide the mistakes made by man in our cities. The result is that when we show our town to visiting dignitaries or to our relatives we do not take them to the industrial quarters or to the regions of modest homes, where the great majority of our population live, but only to the residential quarters of the very well-to-do, where houses by virtue of their size and the fortunate use of the services of architect and landscape architect are likely to be much more creditable.

Standards of construction declined at about the same period in which architecture fell off, though perhaps a bit later, for the type of house with the mansard roof was ordinarily well built and yet marked a decline in architectural taste. The use of less enduring materials for the construction of frame houses doubtless bore some relation to the progressive depletion of our forests, for as timber became more expensive the tendency to use less of it and to use lower grades of lumber increased. But more striking still was the factor of poor workmanship. For as our cities grew rapidly following the industrial revolution, it became profitable for builders to put up large numbers of houses to sell to any comer instead of building houses to order. The desire to make quick profits outstripped pride in craftsmanship and hence houses were slapped together, painted up attractively, and equipped so that they would look well to intending purchasers and sold before the period of depreciation had set in.

The speculative builder's chief interest was to unload as quickly as possible so that he could get his capital free to build more houses. The purchaser seldom knew the difference between a house that was well built and one that was poorly built, or else had no choice, since all houses were poorly built. After a year or two he would notice signs of poor construction, the roof would begin to leak, clapboards would spring loose, coal bills would be unduly high from defects in the heating system, and so on. Though the initial price which he paid for the house might not have seemed excessive, his bills for up-keep were surprisingly high. Often his income did not grow rapidly enough to make it possible for him to keep the house in good repair. Whole neighborhoods suffered depreciation of property values because of the failure of certain individuals to paint their houses or to repair sagging porches, hanging gutters, and broken steps.

Sound construction as well as good design is therefore the concern of the whole community. Civic interest should stimulate community leaders

to take measures which will protect their city or village from eye-sores and from rapid depreciation. This, however, is merely the negative phase of our program. For it is possible and desirable as well to undertake positive measures for the development of civic beauty in residential sections.

Better Homes in America, Inc., which was established in 1922 with the help of Herbert Hoover, who until now has served as president of its Board of Directors, was organized largely for this very purpose. Its primary interest is the promotion of single family housing and home ownership, but with insistence everywhere that the homes to be built shall be *better homes* in every sense of the word—better in design, in landscaping, in construction, in equipment, in furnishing and in the opportunities that they offer for the development of wholesome home life. . . . .

The programs promoted by Better Homes in America have been designed primarily to reach the consumers of houses rather than their producers. It takes time to convey the essential information to an entire nation but unquestionably this and other movements are making important contributions to the development of discrimination in buying and to a demand on the part of home-owners and home buyers for better architectural design and better construction.

The producers or builders of houses should, however, also be reached and be helped to see their responsibility for the maintenance and development of high standards. This argument has been most effectively stated by the secretary of the Massachusetts Association of Real Estate Boards, Mr. Reginald Mott Hull, of Boston, in a recent address, as follows:

Good taste seems to me to be permanently good. Styles in architecture become popular and sometimes their popularity passes, but if a given style has been developed with good line and proportion, and later its popularity passes, the sum total of good taste has been increased and property built in that style with good taste has acquired a value which will be permanent. On the other hand, while bad taste is bad enough when the house is new, when it is old and the fad has passed the depreciation in the property is accentuated, and increased, and the more houses that are badly built in that style, the more overwhelming is the ultimate loss.

One level-headed real estate man with whom I have discussed this matter comes back at me with the remark, "The bad ones are sold," to which my reply is that the public does not often have a chance to buy small houses built in good taste.

Another reply is that everyone does not want the same kind of house, and the fact that these houses in poor taste are bought is that somebody likes them. My

reply is that the public should have the choice between good styles of architecture, but not between good and bad examples of a style, and I believe that given the choice between a house of good architecture, or of bad, of the same price, most people would take the good. Also, taste being a matter of individual development, the more well-designed houses there are on the market, the better educated public taste would become.

From the standpoint of the purchaser of small houses an important matter is the resale value. The man building a house of six rooms is likely to put a large part or all of his savings into it. If in the future when he sells, the style has changed and he has a house in bad taste as well, he is likely to lose money which might have been saved. Any new house may catch a purchaser when the paint is fresh, the lawn newly graded and the house is clean. It is in the old house, run down and unpainted, where the contrast is strongest. Then, if in addition to the depreciation there is bad architecture, little except land value is left.

If the well-designed house can be sold, re-sold and mortgaged better, self-preservation will force the speculative builder to use good plans, good construction and reasonable financing.

4. The Architect

THE DUTIES OF THE ARCHITECT[1]

The employment of a professional adviser has been proved of value both economically and aesthetically.

Financially, the architect should be able to save his fee to the owner by suggesting economies in planning, in construction, and in the use of the materials which will not detract from the essential requirements. This is due to his experience in handling similar work and his training and familiarity with the building-market. Some of the simplest examples are in the grouping of flues to save chimneys; or in the placing of the plumbing fixtures on the different floors so as to save piping for supplies, wastes, and vents; or again by specifying those materials which are most available or wear best under local conditions.

From the artistic point of view the architect should either recommend to the owner the type of design best suited to the individual and the locality, or, if the owner has already determined in his own mind the character of house to be erected, he should be able to point out and eliminate defects, and at the same time further develop the individuality to be expressed, and emphasize the attractive features. His assistance in this case is particularly valuable, for from flat drawings he can visualize the

[1] From the *House Beautiful Building Annual, 1925*. (Boston: Atlantic Monthly Press, 1925), pp. 1–4.

house that is to be built; he senses the relationship of plans and elevations and so does not unwittingly place a second-story fireplace over the middle of the parlor ceiling, or make similarly awkward arrangements. He can analyze the special effect of age or richness his client desires, and point out how it may be produced by some small change in surface texture or by modulation of color. The width of a stone joint, or the proportions of a wood stair may signify as wide a difference between the best and "good enough" as between a Corot and a chromo.

In selecting the architect, both his artistic qualifications and his business ability must be considered. The best way to determine them is by judging the houses he has built and by talking to his former clients. . . . . The terms of employment should be frankly discussed at the beginning, no matter how close a friendship already exists between the interested parties. The amount of the fee and the services to be rendered should be agreed upon, even to such details as the terms covering abandonment of the project, or the point in the preparation of the drawings—say, when the working-plans are started—after which the cost of redrawing radical changes shall be paid for by the owner.

It will facilitate the work of the architect and all future dealings with him if the owner can come to a definite and candid understanding not only as to the terms of employment, but also as to the limitations of size, quality, and cost for the new building. There is a common belief that an architect will make a house cost more than the owner can afford to spend; but this is not so. If the budget is carefully prepared, ... this can be avoided; but all the facts must be faced as frankly as a patient would explain his symptoms to his doctor, and the limit of expenditures must be recognized from the beginning.

After the first conference of the owner with his architect, a clear understanding should be had as to what services are to be expected from the architect and what his remunerations are to be.

His commission may vary on a domestic design from 6 per cent (the architect's minimum "living wage") for a house costing $10,000 or over, without unusual features or much ornamentation, to 10 per cent or more for a very small house, or for one where a great deal of special work is involved. This sliding scale is necessary, as the time required by the designer and specification-writer is almost as great on a building costing $10,000 as on one costing $15,000. There are no more types of doors and windows to be drawn out with full-size sections, the detailed written description of the materials is no more complicated, and the client will

expect as many hours of conference; for, after all, to him it is the most important house in seven counties. Many architects who have reached preëminence in domestic design charge 12 per cent or 15 per cent on all their work, as the demand for their services justifies the increased rate. On the other hand, if the owner does not wish to pay the customary commission he will get no more than he pays for. . . . .

If unusual engineering requirements are involved, whether in the structure or in the mechanical equipment—such as bridging quicksand or an individual sewage-disposal system, requiring the advice of a specialist—the additional fee is paid for by the owner; but this is not likely to occur in a house of medium size.

In the purchase of furniture or special objects of art under the direction of the architect, a fee of about 10 per cent is customary.

On completion of the preliminary sketches, *one-fifth* of the total estimated fee is due the architect; on completion of the working drawings and specifications, an additional *two-fifths;* and the remaining *two-fifths* as the work progresses.

If radical changes are made, causing the redrafting of plans already prepared, or if the project is abandoned, the services of brain and hand which have been rendered in good faith should be paid for. The basis may be as outlined in the paragraph above, or on an hourly basis, as shown by the architect's office books.

The architect's definite duties, aside from being the guide, philosopher, and friend of the owner, are to consult with his client in preparing the preliminary sketches and estimates; to make full working drawings and specifications; to obtain estimates; and, after passing upon them with the owner, to draw up the contracts. At all convenient times he is at the service of his client for consultation. He must make small-scale and full-size detail drawings; and the more of these included in the estimating drawings the better. After the contract is signed he supervises the construction, and he certifies to the amount and time when payments are due the contractor. Finally, after a last painstaking inspection, he passes upon the completion of the building in relation to the contract, which includes the written agreement, the drawings, and the specifications.

The architect is the agent of his client throughout the progress of the work, and it is his duty to see that the owner's interests are protected, not only in so far as the quality of the design or materials is concerned, but also in drawing up the legal documents and checking the financial

arrangements. After the contract with the builder is signed by the owner, the architect must act also as the expert who passes judgment as to whether the agreement is being properly executed, and therefore he must also pass on the relationship between the owner and the contractor as well as on that between the builder and his subcontractors.

Occasionally a prospective home-builder will wish to employ an architect with the idea that a few sketch plans and elevations are all that are required; but it should be remembered that, in addition to this, it is essential to have careful working-drawings and detailed specifications; first, that the owner may know exactly what is contemplated, and may get accurate information on the cost before the work starts; second, that the estimators may figure closely; third, to avoid the danger of extras at a later date; and fourth, to ensure the avoidance of mistakes or misunderstandings in the coördination of the many trades which will take part in the construction.

No one would build an automobile from the beautiful colored drawing and brief description in a magazine advertisement, or expect to create a dressmaking triumph from a fashion plate if he knew nothing of materials and fittings. Yet many a prospective house-owner will expect to build his own home, a more expensive and permanent investment than either car or cloak, from a small perspective and two sketch-plans, leaving the details to any stray carpenter. And it is those carefully studied detail-sheets over which the architect must labor that give the final touch of line and grace, of strength and character.

In describing the architect's duties, reference was made to preliminary sketches in contradistinction to the working drawings.

Sketches or studies may be small and simple, but even then can serve as an indication of the grouping of all the elements of the plan and the essentials of the artistic treatment. These can be altered, amended, or even redrawn with comparative ease. The very fact that the studies are not precise leaves the imagination free and the mind more open to suggestions. It is like fitting a dress before the seams are sewed.

Working-drawings must be made on a larger scale, preferably with one-quarter of an inch equaling one foot, or, as it is called, "quarter-scale." With the preliminary sketches two floor diagrams and a freehand perspective may suffice; but for working-drawings all the floor plans and the roof, all the façades, and several sections should be drawn out with the materials indicated, and with explicit dimensions noted on all the sheets.

Details like the swing of doors, location of light fixtures and push buttons, headroom under stairs, and rainwater conductors should at this stage all have been carefully considered and noted. The working-drawings should also include, even in the estimating stage, details of the exterior and interior on the scale of $\frac{1}{2}''$ or $\frac{3}{4}''=1'$.

Such sheets require much time and skilled labor. Changes which in themselves appear slight may involve rearrangements of supports or piping, doors or stairways, on each plan, section, and elevation, and cause a considerable added expense to the architect. When plans are redrawn at this stage owing to the client's new ideas, he should pay for the cost of the unforeseen labor to which the architect has been put.

Specifications which accompany preliminary drawings need be only one or two typewritten pages, listing the most important materials in the walls, floors, and roof, and a line or two on the heating, plumbing, and electric wiring. Working specifications, however, should cover explicitly all the materials which are to be included in the construction and the method of installing and finishing them. For example, if brick walls are called for, the common and face brick, their bonding and jointing must be described; their protection during erection from frost, rain, and drought and their pointing and cleaning-down noted; the character of the sand, cement, lime, and coloring matter, and the method of mixing the mortar, and the tests and restrictions must be fully covered; the preparation of samples and the building in of door and window frames, outside brackets, interior framing, nailing blocks for applied woodwork, flashing, and so forth, all included, if the specifications are to be really complete.

The specifications should clearly differentiate which part of the work belongs to any trade; they should be arranged in the general sequence the construction is to follow, and should be presented paragraph by paragraph, for ease of reference and to avoid misunderstandings on the job.[1]

After the contract is let, full-size details are prepared, by the architect, of doors and windows, balusters, cornices, mantels, and the like. The true artistic quality of the whole design may depend on these drawings, whether it is the delicate refinement of the Colonial period or the daring richness of the Spanish Renaissance. A crude entrance doorway may ruin a well-proportioned house, or a charming fireplace may "make" a living room.

Shop drawings, based on the architect's plans, are made by the contractor and may be called for from any one of the various trades as needed.

[1] For further information on specifications see pp. 189–94.

Their purpose is to show any particular information which should be checked before actual execution is under way—such as a jointing schedule, if there is a stone portico, or assembly sheets for metal work if there are iron balconies, and similar diagrams depending on the scope of the work.

As soon as the contractor takes possession of the site, the architect's supervision begins. This need not be continuous, as the importance of inspection varies with each part of the construction. For instance, in concrete work, each batch which is mixed and poured may be defective. Unless both the contractor and his foreman are reliable and painstaking, the architect must give almost constant supervision, because, the material once poured, it is difficult to detect faults or remedy them if found. On the other hand, in placing the floor timbers, a quarter of an hour's inspection can check a week's work by the carpenter. A mistake in spacing or sizes can be readily seen and the correction ordered.

The better the general contractor and the better his chance of making a reasonable profit out of the job, the less need there is of a close and critical supervision by the owner and architect. This is a consideration the owner must bear in mind when placing the contract, not allowing himself to be governed entirely by the prices submitted.

Inspection is by no means merely police duty. The architect and owner should treat the contractor as an ally rather than as a natural enemy. A friendly spirit of mutual give-and-take will expedite the work and stimulate the builder to make minor concessions beyond the letter of the contract.

Payments by an owner are made only on the written recommendations of the architect, who submits them monthly as the work progresses. Before construction begins, the contractor should submit to the architect a schedule showing how the total cost in the agreement is to be subdivided. . . . . This itemized schedule serves to check the applications for payment, which are subdivided in the same manner. For example, the amount asked for on the value of the labor and material for brickwork incorporated in the building, compared to the total amount originally assigned to that trade in the schedule, can be checked approximately by comparing the brickwork already completed with that required for the entire building.

[Note.—The Illinois Society of Architects has divided the services of the architects into five fundamental functions: (1) the making of preliminary studies which is in reality the diagnosis of building problems, (2) preparation of the working drawings, (3) preparation of specifications which cover all items of information, (4) detail drawings, (5) general supervision of the work.]

SUMMARY

Certain forms in building have come to express certain social functions. Proportion, balance, rhythm and harmony, contrast and scale—all are essential factors in the consideration of architecture. The forces that change architecture from one style to another are new materials, new modes of construction, and the rise of new social habits. Form and function, beauty and use, are coupled together in every good piece of architecture. The correct use of materials and forms which are also essential for beauty vary with both locality and climate.

Each architectural style has its definite characteristics, although a house of pure architectural style rarely is found. These various styles which have been used in America have been adapted to meet the needs in this country and adapted also for the section of the country in which they are located. The styles most common in domestic architecture are Colonials and adaptations of English, French, Spanish, and Italian. Design, however, is best developed from plan and not plan from design, therefore if the house meets the family's needs and requirements, it often does not even resemble a style. Few small houses are planned by architects, but through the work of such organizations as the Architects' Small House Service Bureau, better architectural service by operative builders, and appreciation of the value of good architecture by the general public, small-house architecture has improved.

The most satisfying houses architecturally, undoubtedly, are those which are designed by architects. The important functions of the architect are: (1) to make preliminary studies, (2) to prepare working-drawings, (3) to prepare specifications, (4) to prepare supplementary and detailed drawings, (5) to supervise the work generally.

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CHAPTER V

HOUSE-PLANNING ESSENTIALS

THE PLAN OF THE HOUSE

A competent architect should be capable not only of producing an artistic and pleasing exterior design suitable for its particular site but he should be able also to develop a convenient, attractive, and straightforward house plan. It is obvious that the plan governs to a large extent the exterior design and the particular architectural style. Too often the prospective home-owner makes the mistake of visualizing the house plan and the exterior design as unrelated while in reality they should be developed together and each should express the other.[1] After the site is selected the plan doubtless should be the next consideration, and it should be developed with the exterior design in mind. The first consideration in developing the plan is obviously the amount of money to be spent. The following then should be considered: (1) Size and make-up of the family; (2) activities to be carried on in the household; (3) needs and desires of individual members; (4) the site on which the house is to be built; (5) beauty and attractiveness in development; (6) placement of furniture.

Some progress has been made in house-planning, particularly in the planning of small and inexpensive homes. Scientific investigations and experiments on ventilation and the value of sunlight, time studies and

[1] In some of the new planning experiments the exterior design has been made subservient to comfort and convenience and the house has been built around the plan. Such a project exhibited in Paris is described in the following paragraphs:

"What probably will be the most curious street in Paris for many years to come was opened recently by the French Minister of Commerce, the Prefect of the Seine and the Prefect of Police.

"The street consists entirely of houses built on the most approved principles of hygiene and in the plans which recall some ultra-modern exposition of decorative art rather than the staid, uniform apartment houses of Paris.

"Situated in a district of Auteuil, which has retained its century-old trees and still boasts of many open spaces, the new street has been named rue Mallet-Stevens, after the distinguished French architect who designed this experiment in house construction.

"Seen from the outside the buildings present an entirely different aspect from those in the surrounding streets. Balconies, windows in rows and sloping roofs have disappeared. Stories are undefined, some being higher or lower than the adjoining ones.

fatigue studies of household operations, and a better knowledge of the requirements of individuals have raised the standards of houses. Many are now being planned with consideration for cross ventilation in bedrooms and kitchen, good circulation of air throughout, sunlight in every room whenever possible, convenient arrangement of rooms, and wall and floor finishes and built-in equipment that will eliminate all possible labor. Consideration also is given to rooms that are pleasing in proportion and with a desirable outlook.

WHAT IS GOOD PLANNING?[1]

By ARTHUR C. HOLDEN
Architect

A well-planned home is a home so thought out and so put together that the things that have to be done may be done with the least possible irritation and monotony. At the same time the well-planned home should stimulate those human faculties whose culture makes for racial progress. Expressed in a few terse words, the ideal house is one where the vexations that make the human spirit mean and ugly are lessened and those influences which make the human spirit large and beautiful are increased. The house that is really well planned should serve both these ends.

There is, however, apparently considerable confusion in the public mind about the whole business of house planning. So many houses which have been called beautiful have been found to be so utterly impractical,

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Windows are of huge size, and more like those of some modern factory than of a private home.

"The architect's idea was to make architecture subservient to comfort. The houses are, as it were, built from inside outward. When the rooms are large and airy, the windows are proportionately wide and high. But there is nothing hideous about these dwellings. The outer openings are painted in all colors blending harmoniously with the gray of the walls.

"And once inside the houses of this queer street one realizes that the architect had some far better purpose than building an elegant frontage. He built his house from the inside out. He has tried to make a street of habitable dwellings, convenient, airy, full of light, easy to work in, comfortable and harmonious.

"The oddness of the outside does not appear at all indoors. The doors, windows and stairways are planned so as to give the maximum convenience. These houses are built for living in, ... There is nothing superfluous" ("Cubist Houses in Paris," *Housing*, March, 1928, published by the National Housing Association).

[1] Adapted from "What Is Good Planning?" *House Beautiful*, January, 1930. Reprinted by permission from the *House Beautiful* magazine.

and the usual run of houses which are considered practical are in reality so tawdry and uninspiring that the public has well-nigh come to believe that the two elements are irreconcilable.

It would be far nearer to the truth to admit that the business of designing our homes has been in the hands of people who have been incapable. In spite of the twentieth century's progress in the development of great steel-frame and reënforced-concrete structures, comparatively little progress has been made in the design of homes for any except those who can afford to pay well. Possibly the reason lies in the fact that the best brains have been monopolized to design the larger buildings, and it has been left to anyone at all to design the average run of homes. It has been assumed that the man who put the house together could work out his own design. If plans are a help to him and save him time, then get someone who knows how to draw to make the plans. Teach a boy to draft and call him an architect. Then, because everyone else is busy, let him design the homes for the nation. The vast majority of homes are seemingly executed in just this way.

Nevertheless there are forces at work which have already exerted a great influence toward the improvement of home planning. It is naturally worth our while to find out what these forces are so that we may use our influence to encourage their growth. But there is more to it than that. The public has been merely taking what it could get, principally because it had very little idea that anything better was possible, and only confused ideas as to what good home planning really means. The public apparently has unbounded enthusiasm for what the radio and aeroplane may accomplish, but expects very little in the way of home improvement, except perhaps for the addition of some labor-saving machinery. It is just this confusion and lack of information on the part of the public as to what is possible as well as desirable in planning that keep the public at the mercy of bad planning.

First of all most people think of good planning in too limited a sense. Their idea of a house is likely to be favorable if that house escapes the faults that have been causing them inconvenience. We all know what the usual inconveniences are: Bad repair, cramped quarters, lack of sunlight, and too much drudgery. When the average man or woman who has been suffering because the building was in bad repair walks into a new house with paint that shines and fittings that glisten, ten to one he will take the house just because of its newness. The family that has lived in cramped quarters thinks principally of size and roominess, while the city

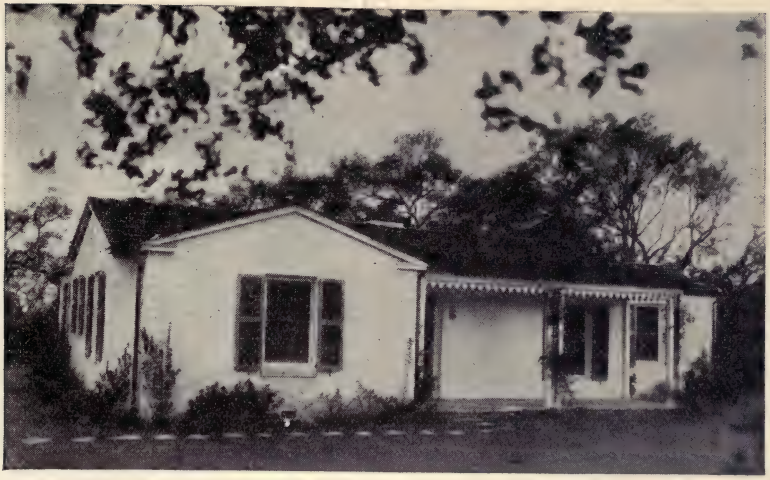

FIG. 20.—The five-room cottage and floor plan (Fig. 21) which received the Better Homes gold medal in the National Better Homes architectural competition of 1930. Note the room arrangement providing opportunity for ample light and sun. (Photograph by Haight.) (Mrs. William Brown Meloney, founder of Better Homes of America, donor of medal.)

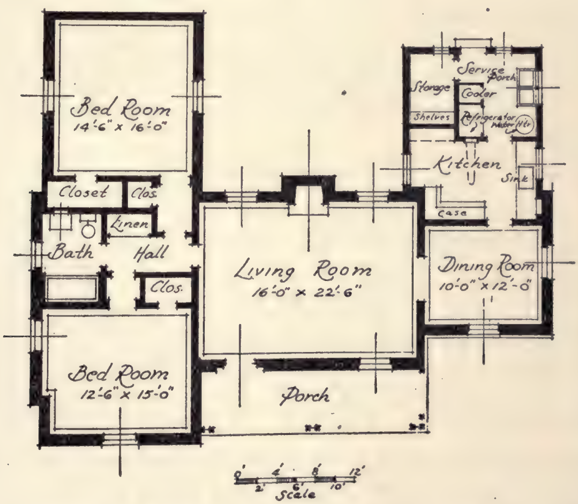

FIG. 21.—Cottage on estate of Mr. William R. Dickinson, Hope Ranch Park, Santa Barbara, Calif. (Reginald D. Johnson, architect.)

dweller who has been cooped up in a dark flat seeks anything with sunlight and space around it. Then again when the tired housewife finds a home offered complete with a dishwasher and laundry machinery, she will want it almost irrespective of other considerations.

It is not easy to describe a well-planned house. That is one reason why so many people live in houses that are anything but well planned. A family's method of living often determines the plan. Many types of excellent plans are suitable only for establishments where servants can be counted on. As we are primarily considering the small house, we shall only say here that the man who wants a small house must forego certain features, such as a central hall running through the house, or a broad staircase, or an excessive number of rooms, which are naturally the part of large-scale planning.

In the first place economy of space is most important. The halls should provide access to the rooms in the most direct manner possible. At least one bathroom should be easily reached from the second-floor hall. Bedrooms should have cross ventilation. The living room should have access to the view, the sunlight, and the prevailing breeze, and also access to that part of the grounds where the out-of-door life is to be lived. The dining room and the kitchen should have morning sun, if possible, and the kitchen should have cross ventilation at all costs. It is desirable to have the out-of-door terrace or porch so situated that there is direct access from it to both the dining room and living room. It is ideal to have what architects call circulation between living room, dining room, and outside terrace, so that a person in each case may pass directly from one to either of the other two.

The size of the living room can be increased by suppressing the hall or omitting it altogether, so that one enters directly into the living room. In this case the main entrance, the stairs, and the entrance to the other rooms on the ground floor must be so arranged that the living room remains livable, and does not become merely a thoroughfare.

The situation of the kitchen is often exceedingly difficult in the small house. The old idea was that, of course, the kitchen must be placed at the back somewhere, but particularly since the days of the automobile the rear has been found to be frequently the most livable part of the grounds, so that modern planning is tending to put the kitchen at the side or even in the front. This permits easy access from kitchen to front door without wasteful hall space or without passing through dining room or living room.

The old idea of the rear yard as a proper place for the stable accustomed us to placing the garage in the same location, in spite of the fact that the problem is entirely different. For this reason miles of needless side roadways have been built, and the privacy and desirability of the rear areas have been destroyed. The only valid argument against placing the garage at the front or side is that the doors when open are unsightly. As yet we have not succeeded in working out a door treatment which will not tend to throw the rest of the house out of scale, but the logic of the location on the street front is incontrovertible.

It is almost incredible what a number of schemes of arrangement are possible for the small house. We can do little more than touch on general principles. First there is the square plan or short rectangle, which is compact and by some considered the most economical. Where there are four principal rooms on the second floor each can have corner ventilation, but through ventilation is not as good as in the Z plan or the "long" plan unless the house is small, in which case of course three-sided ventilation can be obtained without difficulty.

The long plan is generally the result of adding one or more wings to the square types. One wing generally contains the service rooms. Difficulty is usually encountered in providing access to the wings. Long halls are always undesirable. Only occasionally, and then only for some special advantage to be gained, should they be tolerated in the small house. Frequently a long plan is necessitated by reason of the narrow shape of the lot. It is a sad commentary on the ingenuity of American real-estate promoters that this difficulty is so prevalent. The plan is worked out on the theory that there is light and air on all four sides, but the house is frequently placed within three or four feet of the lot line so that the interior rooms are usually dark. There is no excuse for this type of plan. Where land is so valuable that lots of forty feet minimum width are not economic for the single house, it is best to recognize that an avowedly city type of row house or multifamily dwelling is preferable. The real reason that this narrow type persists is that building codes even in large cities still permit frame houses to be built huddled closely together provided the wall is not actually built on the lot line, in which case a masonry wall is usually required.

Contrary to what might be expected, the L type of plan offers great possibilities for small-house design. Small houses are frequently out of proportion because, though the rooms are small, the ceilings must still be sufficiently high for a man to live conveniently, while, at the same time,

for good design the roof lines have to be kept as low as possible. In the informally heated houses of our ancestors the attics were low and snug and no one worried about fresh air. Now, however, our houses are thoroughly heated and we have more knowledge of hygiene. We cannot therefore solve this problem so simply. But by placing the ridge of the roof off centre we can maintain full headroom over most of the second floor and at the same time reduce the height of the roof line. By placing an L-shaped ridge over even a square plan very little headroom is lost and dormers are only necessary for the legitimate purpose of cross ventilation.

PLANNING THE SMALL HOME[1]

By DONN BARBER, A.I.A.[2]

. . . . It is quite extraordinary to note that in spite of a general apathy toward things artistic, we are really making steady progress. Homes all over the country are getting better and better in suitability, planning and in execution. Individual examples are cropping up everywhere that are full of charm and beauty and constructive promise, but taken as a whole our houses as a real expression of satisfactory domestic architecture are way below par.

The homes of a nation reflect more clearly its personality, its degree of enlightenment and its position in the scheme of civilization than any other form of building. That is, the home reflects the individual taste and quality and character of its individual owner. Therefore homes collectively reflect the composite ideals of the people.

Home building in its innumerable phases is now being more broadly considered and discussed in this country than at any time of which we have any knowledge. Every detail of plan arrangement, type of construction, character of finish, manner of decoration and furnishing is being analyzed, exploited and continually spread before us in every periodical and newspaper.

It is perhaps truer in architecture than in any other art that a little knowledge is a dangerous thing. Few study the principles and practice of this art to the point of having any adequate capacity to differentiate even broadly between what is intrinsically good and what is bad.

Those who do not actually build new houses, buy and alter them, or rent and redecorate them; so that it is high time that the serious study of at least the elements of architecture should be required and taught as a

[1] In *Small Home*, June, 1925.

[2] Mr. Barber was, before his death, a Fellow of the American Institute of Architects.

part of every educational curriculum. Our children should be instructed in the applied arts at an early age, and later in the history of art, so that they may grow up with a clearer understanding, a more sympathetic attitude toward man's age-long effort to express the beautiful in matters of building and environment.

The planning and building of a home is a more involved process today than it was a generation ago. The cost of labor and materials has become vastly higher, in addition to which living conditions demand more intricate requirements in mechanical equipment generally comprehended under the titles of heating, plumbing, and lighting, which combined, not infrequently amount to one-quarter the total cost of the house.

After the price of the property and its necessary improvement has been deducted from the total budget allowance, the remaining amount available for the house should be divided by the probable cost per cubic foot obtaining in the chosen locality for the type of house desired. This will determine the volume in cubic feet of building that can be planned.

The arrangement, size and number of rooms obtainable within this cubage should be thoroughly considered and studied, and should in all cases be governed by the volume the cost permits rather than by preconceived ideals of living needs. If this principle is adhered to a great many of the usual disappointments and tragedies of exceeding the budget will be avoided. The sizes of rooms planned should be governed by comparison with the rooms one is familiar with and lived in. If it is impossible to obtain the number of rooms desired in the given cubage, it is better to eliminate one or more rooms than to build rooms of small or impractical size.

Every home should be composed of the fewest elements possible, straightforward planning making convenience of paramount importance, and living requirements reduced to the most direct and labor saving effort. As we learn to live more sensibly so will we build more sensibly.

Houses should be seriously planned, and built with words, and paper and pencil before venturing into the realm of construction. There is a surprising lack of definite knowledge among laymen as to exact sizes and dimensions of the things they see and use continually. Many amusing tests built upon this fact will be called to mind, such as guessing the height of a tall hat against the wall, or asking one to draw a picture of the face of one's watch. People who intend to build a house should begin observing and measuring; they should prepare a full notebook of their

observations, including the mistakes and successes in the houses of their friends. It is not always the lack of money that makes houses stupid and commonplace. It is often the want of foresight and the lack of application of ordinary common sense in planning. Few people build more than one house in their lifetime; it should therefore be well and wisely built with every precaution and care conceivable. There seems to be a wide demand today the country over for houses containing three, four to five and six rooms, that is, houses containing in general a living room, dining room, kitchen, and one to three bedrooms. . . . .

The small house problem has been broadly met on the Pacific Coast by the bungalow type of house where it originated and has been developed. The bungalow is an all-on-one-floor type of house and seems to appeal to women who do their own work. The bungalow has advantages in certain climates. Its principal disadvantage in our colder eastern climate seems to be that the sleeping rooms are too near the ground. Bungalows seldom, if ever, have cellars. In a northern climate some cellar space is essential for various reasons; furnace, coal and storage space are required, also a laundry. The natural place for these is in the cellar. People in northern climates seem to prefer to sleep upstairs; . . . .

Bungalows are more expensive than two-story houses if given the same number of rooms, for roofing surface, excavations and foundations, are items of considerable cost, which automatically reduce in favor of the two-story house.

The two-story house separates logically the living and service portion of the house from the sleeping portion of the house. Its only disadvantage is a staircase and hall space which have to be maintained and kept clean. The hall space upstairs, however, may be kept small and can serve the bedroom and bathroom conveniently. Bedrooms should have closets and should have the beds placed against inside walls and plenty of windows. The bathroom should have tile floors always, and wall if possible; if not tile, a substitute that can be easily washed and kept clean. A linen closet should open from the hall.

Three bedrooms seem to be a minimum, one principal room, one for children and a spare room that may be used for children or a servant, or guest. A sleeping porch is a luxury and not necessary if the bedrooms have plenty of windows. The living room should be of fair size and have a fireplace which eliminates the necessity of furnace heat till cold weather comes.

Kitchen should have outside door and a porch, however small, with outside closet and ice box near outside door, or on porch.

Main floor should be at least three feet above ground; cellar should be not less than eight feet high in the clear and have steps to outside.

A mistake too often made in the designing of a small house is an attempt to imitate and reproduce in reduced dimensions elements that have been found to contribute to the attractiveness of a large house. Reduction in measurements and proportions of elements that have fixed human scale results in dwarfing unnaturally a given composition. By a similar process of reduction a full size man becomes in effect and personality a dwarf rather than a child.

The practical elements accepted for human use and contact in house designing, such as steps, doors, and heights of railings, and window sills, and the like, must remain the same in general dimensions whether they occur in a large house or in a small one. A small house should not be a big thing built in a small way, but a small thing having a definite individuality built in a big way.

Fixed standards should be satisfied first of all. The amount of window opening in a room, for instance, should have a direct bearing upon the dimensions of the room to be lighted. There are generally accepted standards of measurements used in furniture, that is, in the heights and sizes of chairs, tables, beds and bureaus, as there are also standard heights of sinks, wash basins, bath and wash tubs. The way to make a house convenient, usable and suitable in scale is to be sure that all these standards of practical measurements are satisfied and that sufficient living space remains.

Then again every year produces an increasingly wider range of choice in the selection of available materials for use in every department of structure and finish. The market is flooded with newly-devised and mostly patented processes, some worthy of serious consideration, while the greater number continues in an experimental stage of development. These latter if used at all should be chosen for having some proven history of performance that insures unquestioned and permanent value.

Disappointments are possible even when the greatest caution is exercised in the use of true and tried combinations of known materials. It is unwise, therefore, to experiment with innovations that are apt to complicate if not destroy the practical and lasting qualities of any adopted scheme of construction.

Simplicity and directness in planning, using the fewest possible elements capable of entering into any structure, should be striven for if efficiency and ultimate economy are to result.

CONSIDERATIONS IN PLANNING THE VARIOUS ROOMS

LIVING ROOM

1. A rectangular-shaped room is more desirable than a square one as it provides for a more convenient and pleasing furniture arrangement.
2. Plan for cross-ventilation, for sunshine, and also prevailing breeze.
3. Plan the living room for the best possible view that the building site affords.
4. There should be direct access to the dining room, to an out-of-door terrace, if one is included, and to outdoor living areas.
5. Plan wall space free from windows and doors for the pieces of furniture that require it.
6. Plan the room with the size of the family in mind, and the needs, activities, and desires of its individual members.

THE DINING ROOM

1. The size of the dining room will depend upon the size of the family and the family's custom of entertaining.
2. A space of three feet or more between the table and the wall or the large pieces of furniture is desirable for ease in serving.
3. If the dining room is to provide for as many as six or eight persons, a room rectangular in shape is preferable to one that is square.
4. Plan for plenty of light, a view, and some sunshine if possible.
5. Easy access to the kitchen is essential.
6. Built-in cupboards, and pass closets to the kitchen, are particularly desirable for small houses.

BEDROOMS

1. Cross-ventilation is an essential in good bedroom planning.
2. Plan the bedroom sufficiently large to allow for the necessary pieces of furniture and additional free space.
3. Allow wall space free from windows and doors for beds, dressers, chests, and other high pieces of furniture, and provide for a location for the bed that will receive plenty of air and that will be such that the bed may be easily reached from either side.

4. Plan bedrooms for privacy and with direct access from the hall.

5. Provide for easy access to bathrooms.

6. An adequate closet should be planned for each bedroom and when two persons occupy one room two closets are desirable.

KITCHENS

Miss Greta Gray has included the following considerations in kitchen planning in the pamphlet *Convenient Kitchens:*[1]

1. First, last, and all the time, in planning and equipping a kitchen, think about the work to be done in it.

2. If building or remodeling a kitchen, make it oblong and with no more floor space than actually needed. A kitchen is a workroom. Spaciousness is paid for in miles of extra steps.

3. Study the relation of the kitchen to the rest of the house. Make a direct connection from kitchen to dining room in the common wall between them. See to it also that there is easy access to front and back doors, to the telephone, to the stairs, to the cellar, and to the second floor.

4. Arrange for adequate ventilation in all weathers and for good lighting at all work centers at night as well as during the day.

THE PLAN SERVICE OF THE ARCHITECTS' SMALL HOUSE SERVICE BUREAU[2]

By JAMES FORD
Executive Director, Better Homes in America

Skilful designing and planning of small houses has recently been made available to all American home builders. Until this past decade few but the well-to-do have had access to the expert service of professional architects because of the inability of others to pay for such service. Inexpensive homes in the past were designed by contractors, builders or owners or else were built from stock plans which had been drawn by persons untrained in the principles of design. One of the most significant indications of progress in the past ten or fifteen years has been the insistence of leading architects, magazines and newspapers that even the small home could be made a thing of beauty, efficient in its arrangements and yet within the reach of families of moderate incomes.

Professional and business organizations are increasingly broadening their outlook with reference to civic responsibility. Their first interest used to be the making of quick profits and all too frequently their mem-

[1] U.S. Department of Agriculture, Farmers' Bull. 1513, p. ii.

[2] In *American Building Association News*, March, 1930.

bers have been willing to make large profits at the expense of their clients. More recently, however, it has been recognized that it is the prerogative of each business and profession to discover the needs of its clients and if necessary help its patrons to raise their standards and create a demand for quality.

President Hoover, during his service as Secretary of Commerce, was responsible for the inauguration of hundreds of conferences among specialized business groups which developed this idea of public responsibility and interest in civic service through the daily business routine. For each individual can usually make his greatest contribution to the general welfare through his daily activities. The codes of business and professional ethics which have developed amazingly among our commercial organizations in the past ten years are but an expression of this new constructive tendency.

Architects are professionally trained in the principles of efficient design and sound construction. Beauty of line and workmanship and practical efficiency are the chief ideals inculcated in their training. Their original interest may have been chiefly in monumental architecture, magnificent public buildings which would be a source of community pride and inspiration for generations to come. But the developing recognition of civic responsibility has led them to see the necessity of bringing beauty and practical efficiency in architecture within the reach of the home builder of modest income. It is greatly to their credit that through their national professional organization, the American Institute of Architects, they have established a national Bureau to educate public taste in small house architecture and to bring good design and practical economic planning for comfort and convenience, within the reach of virtually all builders and owners of small homes.

The Architects' Small House Service Bureau of the United States, Inc., is a professional organization composed of many practicing architects from the leading architectural offices of the country. The Bureau is controlled by the American Institute of Architects and endorsed by the United States Department of Commerce. It is the only housing Bureau in America, producing and offering plans for three, four, five and six-room homes, that is so controlled and endorsed.

In purpose it is a public service, operating on practically a non-profit making basis, to give the small home builder a square deal, and to improve the architecture of a class of dwelling which seldom has the architect's service.

The Bureau offers a limited service. For those willing to use "stock plans" prepared by architects, but none the less desirable because they are "stock drawings," the Bureau provides many of the privileges of architectural service at a price within the reach of all.

More than two hundred and fifty plans, including a wide variety of types, materials and sizes of small homes are ready for use. These plans are not the work of one, two or three architects. They represent the coöperative study of many men. Even though they are "stock drawings" they are quite as complete as would be produced by an individual practicing architect. Because they are distributed in quantity, they can be sold at a nominal charge.

Each plan is studied to provide modern conveniences, adequate living accommodations, sound construction and good taste. Simplicity, elimination of waste and extras, flexibility of plan to meet lot conditions and many other essentials of good housing are given careful study.

Each plan is accompanied by a bill of materials listing all the quantities to be used in the erection of the house. More than fifty printed pages of specifications and two contract agreements accompany each plan. In addition to these instruments of service, the Regional Bureaus provide what is perhaps quite as valuable an aid to the builder as the plans themselves; namely, professional counsel and advice, and at no extra charge over the cost of the blue prints.

The Small House Service Bureau sells its service for an average cost of approximately $6.00 per principal room. For this nominal charge home builders may now secure dependable plans from an authoritative source, and enjoy many of the privileges afforded those who build larger homes at greater cost, and employ the services of an individual practicing architect.

The Bureau does no individual designing. It recommends to all who want homes larger than six rooms in size that the service of an individual practicing architect be employed.

The following statement prepared by Robert T. Jones, Technical Director of the Architects' Small House Service Bureau and editor of *The Small Home*, explains clearly and forcibly the values of the service of that Bureau:

Plans for small houses are not developed by guess work or by some strange background of artistic sensibilities. They represent the hard work of an expert to solve a problem. The problem is the home builder's requirements. When the home builder tells what he wants that is the problem. The solution consists in

answering those requirements. Now it takes much skill to do this well. It takes long years of experience. It takes a knowledge of materials, workmanship, costs, and it requires the power to assemble the necessary forms so that they will have good architectural quality.

Many people, not knowing what the architect does, believe that the architect adds only the froth—whatever ornamental quality the house has—nothing more. This is not the least important part of his work, but it proceeds from a basis far more fundamental. As I have said, it begins with the knowledge of the home builder's problem. That means the plan. The rooms have to be arranged in an orderly manner, so that they will be commodious, comfortable, taking advantage of the site and locality, providing for furniture, the circulation about the house. Then those things have to be assembled so that the construction is sound and without extravagance.

It is comparatively easy to assemble them if there is no question of cost, but to get a rational plan within a limited expense budget requires study, and this background of skill and experience of which I have spoken. Shifting these things so that the balance will be fine, the massing of walls, openings, roofs, decorative in themselves, without the necessity of added ornamentation, is the third part that most people see first of all.

Now what does all this save the home builder. Simply this: It saves his investment, for it assures him a marketable house. Disregarding all the satisfaction that comes from the feeling that a house bears the owner a good reputation for fine taste, disregarding the satisfaction that results from living in a house that is well planned, there is this perfectly tangible value of a marketable property and one that does not deteriorate either as to the durability of its construction or as to the soundness of its good taste.

We can be more specific. We can say that a set of working drawings, produced as they should be, by a competent architect saves the home builder money directly, for with such drawings the owner knows exactly what he is going to get. With complete drawings and specifications it is unnecessary to make changes, add or subtract matters, involving heavy expense for extras. Sketch plans can at best tell only part of what is to be done, leaving much to the caprice of the contractor. It is only human for him to supply no more than is required. The complete working drawings thus take the guess work out of home building. They are the basis for a contract providing for the delivery of a specific thing. The peace of mind of the home builder is saved with a technical service such as this behind his home building operations.

On the other hand, the incomplete working drawings leave whatever is incomplete to guess work, changes, dissatisfaction. Such plans are not made by architects. Many of them show only the most casual knowledge of architectural form and substance. Produced, as many of them are, apparently over night, they cannot possibly contain the qualities which come from constant study and

careful development, which, from the architect's experience, must necessarily take a number of days.

The building of a home is for most people the most important financial experience of their lives. Rarely the small home builder spends more than once or twice in his life sums ranging between $5,000 and $10,000. To do so without an adequate buying scheme represented by a complete set of working drawings and specifications is manifestly poor business policy.

All over the nation are seen houses built from sketch plans, from drawings seen in books, pictures in magazines and newspapers. Almost invariably such houses show that the careful consideration of the architect has been set aside to the ultimate loss of the home builder. The finenesses of the plan, sound construction methods, massing of the architectural parts, and the more delicate lines of cornices, moldings, and minor details of architecture cannot be materialized from these small sketches. Every architect knows it. These sketches must be appreciated only for their limited worth, that is, the exploitation of general ideas, for they are nothing more.

If we had a nation of building mechanics capable of producing architecture to its fullest extent and with unlimited time at their disposal, who were able to materialize houses within the limited funds of home builders by the simple process of going out and building from sketches, there would be no need for the architect to make complete drawings. But the economics of house building is not built on any such basis. We develop architects to design. They do not build. We develop builders to build. They are not trained to design. To obtain a good building manifestly requires the employment of both these factors—a competent architect and a good builder. Their capacities do not cross. There is not enough in the sketch plan to guide the hand of the most skilled builder.

So we say; make sure. Have complete plans. Do not be deluded with the fallacy that complete working drawings are not essential.

In their trade circular entitled "Our Answers to Questions Home Builders Ask" the Bureau outlines its recommendations and services in the following terms:

Before you build your home you must know exactly how much it is going to cost. No amount of guessing by the most expert guesser will give you this information. The only way to find it out is to have contractors submit proposals to build based on the definite plans and specifications of the house. This leaves out the guesswork.

Building costs depend on local markets, the quality of materials, the finish and equipment demanded, and the contractors who do the building. We have found variations of as much as thirty per cent in the cost of houses built from the same plans in the same town. We can give you broad, general estimates of cost, but you will see how difficult it is for us to tell exactly how much it will cost to build from a certain plan in your city, without knowing all the conditions im-

posed by yourself and by local markets, and the quality of the contractors you employ.

In order to learn exactly how much it will cost you to build a home from a Bureau design you may obtain the complete home building documents for fifteen days on approval. You may submit them to different contractors for bids, and thus learn exactly what they will charge to build the house for you, in your city, finished and equipped as you desire it.

Obviously you will not care to keep the plans if the prices made by the contractors run above your means. Therefore in the following paragraph we offer you an inexpensive method of getting these figures:

First, plans may be obtained on approval for a period of fifteen days, by sending your check for the full amount of the service fee (explained later on).

Second, if you find the cost of building is more than you expected, and you return the documents to us within the fifteen day period, not counting the time they are in transit, a service charge of $5.50 will be deducted from your deposit, and the balance returned to you. If the drawings or other documents are worn or soiled we will deduct also a small replacement charge, at the following rates: Blue prints, $3.00 a set; specifications, $1.00 each; quantity surveys, $2.00 each; forms of agreements, 15c each.

Third, if you decide to retain the drawings, your check in the full amount of the service fee is accepted as payment in full. In other words, there is no charge for taking the plans on approval if you keep them. You will see that the above offer enables you at a very small cost to obtain home building estimates, and thus to determine whether or not you can afford to build. We do not ask you to buy the plans if you find you cannot afford to build from them.

Fourth, if the cost of construction runs higher than you expected, or if you encounter any other difficulties, we ask you to discuss your problems with us. It may be that we can offer suggestions that will enable you after all to build the house you want.

When you purchase a set of Bureau documents you receive three complete sets of blue prints, three sets of specifications, three quantity surveys, two forms of contract agreements. Also, during the building of your home we stand by to help you. Any questions you ask us by mail about materials and methods will be answered promptly, without bias, fear, or favor. We maintain in our organization qualified experts who have devoted years of their lives to the building of homes and who are competent to give you the information you ought to have. There is no extra charge for this service. It is included in the fee you pay.

Our fee for service is based on the rate of $6.00 a principal room, with 50c more for packing and postage. Thus our charge in connection with a five-room house is $30.50. By principal rooms we mean living room, dining room, kitchen and bedrooms. Halls, vestibules, sewing rooms, porches, and bath rooms are not counted.

Minor changes to meet your individual requirements or taste can often be

made in Bureau plans without injuring the durability of the construction or the good design of the house. For example, such changes might be the re-location of a door, the omission of a partition or fireplace, or the addition of a porch, pantry or breakfast nook. Many houses shown with siding exteriors may readily be finished in stucco, or shingles. It is decidedly in your interests that you discuss such changes as you desire with us, to determine whether or not they are practical and durable architecturally, and to enable us to make necessary changes in the working drawings.

The charge for making such revisions depends upon the amount of time required by the draftsman. Often it is possible to estimate in advance what the maximum extra expense will be.

If your lot faces North it is obvious that a plan designed for a lot facing South will not give you the best exposure. This difficulty may be overcome by building the house reversed. Any contractor of average ability can build a house reversed from Bureau drawings without trouble, but we shall send you an additional set of blue prints printed upside down showing the reversed room arrangement, which your contractor may find convenient to use in connection with the original blue prints. There is no extra charge for the first set of reversed prints.

Each home builder has his own individual requirements for plans which depend upon a number of conditions—the size of his family, his taste in architecture, the amount of money he has to spend, the restrictions of his building code, the size and exposure of the lot, and so on. If we were to place before you a catalogue illustrating all our designs—almost four hundred altogether—of many different types of exterior and arrangement of floor plan, your problem of plan selection might only become more complicated.

Therefore if you will tell us something about your needs, we shall select illustrations of the plans that approximate or meet your requirements, and forward them to you promptly.

The Bureau does not design duplexes or apartment houses of any kind. It does not undertake the remodeling of existing buildings or the drawing up of plans to meet special requirements. Bureau service is strictly limited to stock plans for single family residences of not more than six principal rooms. Larger buildings and houses of unusual design have special problems which require the personal attention of an individual architect, and cannot be handled through the use of stock plans.

BLUEPRINTS[1]

To some people blueprints are puzzles so intricate or in such strange language that, rather than attempt to find any order within the chaos

[1] Adapted from "How To Read Blueprints," *House Beautiful Building Annual, 1926* (Boston: Atlantic Monthly Press, 1926), p. 24.

that the many lines and symbols present to them, they leave the matter to their architects. . . . .

If they had made an effort to visualize the house in its complete form according to the design and plans that the architect indicated in his drawings, they would have been spared many, if not all, of their disappointments.

To read plans properly the home-builder must train himself to add the third dimension which the drawings do not show. In the case of floor plans, we have the length and the depth but not the height of the house; and in the case of the elevations, the length or the width and the height but not all three at once. The plan, in other words, shows what there would be of the house if it were sliced open horizontally at any one of the floors and looked down upon from a height. Perhaps the easiest way to understand the floor plan and see the relation of room to room, the location of windows, doors, and so forth, is to trace with a pencil a route beginning at the front door and so on throughout the house. Reduce yourself in imagination to the size of the pencil point and assume an abundance of curiosity about every square inch as you pass through it. Go through all the openings shown on the plans, but think of them as doorways, and erect walls for the partitions as you go. Try the doors and make sure that they swing the most convenient way; sit in front of the fireplace and see whether you find yourself in a passageway or in a comfortable, cozy backwater; stand at the kitchen cabinet or at the sink and see whether you have good light; see how far you have to walk to put away the dishes or to get things from the icebox; think where the best views are; whether you can see them from the living-room windows; and so forth, and so forth. You can play this game almost indefinitely and should play it until you have lived in every part of every room and put all the furniture in its place.

To fit in your furniture cut diagrams of it out of cardboard at the same scale at which the plans are drawn, which is usually what is called one-eighth or one-quarter scale. One-eighth means that every eighth of an inch is equal to one foot; one-quarter, that every quarter of an inch is equal to one foot. Although an architect has a special scale to enable him to read plans quickly, an ordinary rule can be used for this purpose. The best way to get an idea of the actual size of the rooms, however, is to go on a measuring expedition. Equip yourself with a six-foot rule and measure your friends' living-rooms or dining-rooms or bathrooms, as the case may be, until you find one that is approximately the size of yours, or one that is the size you want yours to be.

Elevations are misleading and do not give a true idea of the house as it will appear, for they are drawn as if the eye of the observer were on a level with the topmost line and at the same time on a level with the bottom line. In reconstructing the house in imagination, translating it to a three-dimensional mass of length, depth, and height, it is necessary to remember that in perspective the eye will see much less of the roof and chimneys than is shown on the elevation drawing.

THE VALUE OF SPECIFICATIONS TO THE OWNER[1]

By PHILIP G. KNOBLOCH
Architect

Plans, elevations, details, and specifications—what do they portray to the individual who is about to build? What relation are they to the venture that is to be the most thrilling and important undertaking he has yet considered? Undoubtedly this is the first time that he has come in contact with them.

He is naturally all interest, and makes a determined effort to learn to understand the plans so that he can follow more readily his architect's explanations. In this he is more or less successful so that when he receives the final blue prints he can discuss them with some intelligence. He can take the plans and point out the locations of various rooms, door openings, windows, read the different electric outlet symbols, pick out the stairways and even locate the elusive but ever important closets.

He discovers in looking over the working drawings that among the many dimensions and notes on the plans there is one on the basement plan that calls for concrete floors; that on the first floor plans another calls for oak floors and base; and that the bath on the second floor is noted to have tile walls and composition floor. He can tell from the drawings about how his house will appear, and from one of the details about what he can expect in the way of built-in bookcases and so on. All this tells him that he is to have all those items that are called for by drawing or by note, and up to this point it is quite clear to him; until suddenly he remembers that he had mentioned to his architect that he wanted the basement floors waterproofed, wide oak plank floors on the first floor, and colored tile in the bath. He looks again at those notes but they do not mention anything in detail that he can see. He decides that he must immediately consult his architect so that these omissions can be caught before the blue prints

[1] Adapted from "What the Specifications Really Say," *Small Home*, April, 1930.

are distributed to the various contractors for their estimates. Rushing to the architect he learns that all these details have been carefully covered in the specifications. Then he remembers having heard that word mentioned several times during past interviews. He also remembers his architect having told him that the plans were all complete but a few hours more work were still required to complete the specifications. Yes, he did receive with his blue printed plans a fat roll of typed pages about letter head size.

FIG. 22.—Attractive five-room cottage with floor plan (Fig. 23) which won an award in the Better Homes in America architectural competition. (Small house in Palos Verdes, Estates, Calif. H. Roy Kelley, architect, Los Angeles.)

He remembered opening this roll, carelessly glancing at a paragraph or two, and quickly deciding that this reading could wait until a later date. He thought then that it would be rather dry reading, and guessed it would probably be all right for the contractor to read it. He felt awfully sorry for the contractor though, sorry that he had to wade his way through those closely typed pages.

And the architect had just said that all the detailed information was to be found on those pages! That was news, so he did as the architect said and turned the pages of the specifications until he located the heading of "Tile." Reading a paragraph under this head he saw that the color was specified, the kind of tile that was to be used, the grade required, and also

the manner in which it was to be laid. In the same way he read about his oak flooring, the widths desired, the thickness and method of installation. He turned to the heading of "Waterproofing" and discovered a full explanation of the kind of waterproofing that was going into his basement

FIG. 23.—Floor plan of cottage shown in Fig. 22. (H. Roy Kelley, architect)

and the way it was to be applied. He read further headings and decided that it would be of interest to look into these pages more thoroughly. The more he read the more important these specifications became until finally he admitted to himself they were a very vital adjunct to his plans. And that they are without a doubt. I have had many clients who treated the specifications in just this way.

They are, in short, a condensed form of record of everything that goes

into the job, of what the owner and architect want in the way of work to be done, of materials to be furnished, and of the grade of workmanship desired for the proposed new building. They contain information impossible to show on the drawings, and enable the contractor to estimate intelligently what materials are required and the grade that will be demanded by the architect. They tell him where he can get special articles and just what type of products he must use. He is informed that he must estimate on only what is specified, and that no substitutions will be considered except by permission of the owner through the architect's office. The specifications are part of the completed plans and enter into the contract between owner and contractor. No set of plans can be complete without them, and a thorough and intelligent specification will protect the owner throughout the work from many an unpleasant hour of dispute, and will eliminate about 98 per cent of all misunderstanding.

For example, let us assume that at the time of preparing the plans the owner had decided that he wanted walnut trim in a certain room and the specifications were so written. Six months later when the trim was actually being installed birch had been used by mistake and a dispute arose as to the correctness of the wood used. Instead of wrangling, the specifications were first consulted and all trouble avoided as they plainly called for the walnut. But supposing there had been no specifications to consult, what then? Could an amiable agreement have been reached, based on the memories of owner, architect, and contractor of a decision made six months before? Hardly. Innumerable questions of various sorts arise throughout the job, and with the specifications to guard the owner trouble will be avoided.

They protect the owner as I have outlined, and also aid the contractor, as they insure him against unreasonable demands on the part of an owner or architect. If something is forgotten, no demand can be made upon the contractor to furnish the omission, as he need furnish nothing except what has been called for. This all makes for harmony, which is really the lubricant for the job. I have supervised many jobs and in cases of misunderstanding have always resorted to the specifications as the basis of settling the dispute. Sometimes the contractor misinterprets the meaning of a paragraph, sometimes the owner becomes unreasonable in his demands, but reference to the closely typed roll of specifications always clarifies the matter. It is impossible to argue much when the point in question is clearly defined in type.

As we open the bound pages of the specifications we find we have the

General Conditions to start with. These paragraphs tell the contractor that he is to familiarize himself with the plans, elevations, and specifications so that he will miss nothing, for we take no excuse later on, when he has contracted for the job, that he had not seen this or that when he prepared his estimate. (The words estimate and bid mean the same.) The contractor must base his estimate only on what we call for in the specifications and show on the drawings. This is done so that all the bids are figured on the same basis, and when bids arrive from the various contractors we can compare them fairly for prices. Were one of the contractors to substitute a product of his own thought, even though it be as good as we specified, it would be manifestly unfair to the competitors to include this item in his basic bid, especially should the substitution cost less. This difference in cost would materially aid this contractor in lowering his bid. At the same time it is our desire not to miss any opportunity of lessening the total cost of the building for the owner, so we permit a contractor to make his substitution under certain conditions. He must first refer the item to the architect, and if acceptable he may state in his bid that the substitution is an alternate and that if accepted by the owner so much must be added or deducted from his estimate. By this method we have his substitution as a separate item and it is not to be confused with the basic bid. We also have the advantage, if a saving is practicable, of taking that item into consideration.

Now just a word about extras. The word means just what it implies. Any item or product not shown or mentioned by the architect or owner naturally has not been included in the contract price, and it would be unfair and unreasonable to demand that the contractor furnish the item without additional cost. This is called an extra. Extras are sometimes due to incomplete plans or specifications and are the responsibility of the architect and on the whole inexcusable as thoroughly drawn plans and specifications will prevent them. Of course, if after the contract has been signed and the work started the owner makes changes or additions not originally shown or called for, they are legitimate extras, and must be paid for. We also have the type of contractor who is constantly on the alert for extras, but he is uncommon and of a poor rating usually. Many prospective home builders, in talking to others who have built, hear about these extras and dread their very possibility.

The high type contractor wants no extras any more than the owner or architect. No matter how fairly the extra is figured the owner is likely to feel that he is paying too much for it even though the architect assures

him that the price is correct. When the plans are complete and the specifications thorough, you have no worry with extras.

It might be well at this point to include a word about the number of bids necessary for a fair price. This of course is outside the subject of specifications but nevertheless very important. Naturally the owner can invite as many contractors to bid as he wishes, but many years of trial have proven that six bidders are sufficient. Your architect and yourself can select six high type contractors who have a reputation for honesty, reliability, and financial standing in their business, and whose buildings already erected reflect their attitude toward their work. You will find that bids from such men will be very close, as they figure on giving you a complete and honest job, and in estimating are allowing enough to include the highest type of craftsmanship. It is still true, even as in Aesop's Fables, that after all you get just what you pay for.

PLANNING AND EQUIPPING THE HOME FOR CHILDREN[1]

By JAMES FORD
Executive Director, Better Homes in America

If we are to have social progress, children must be better endowed or better trained than their parents. This means that opportunities for good health and for physical, intellectual and moral growth must be superior to those enjoyed by their parents.

The criteria to be used in gauging the homes in which children grow up should be the same as those by which we test the school, the church or the settlement house or playground. Whether the purpose of the individual life is construed in terms of happiness, interest fulfilment or self realization, progressive achievement of life's purpose is dependent upon appreciation of values, free access to values, and active participation in the creation of values.

Life's highest values since Plato have usually been expressed as Truth, Beauty and Goodness—with subsequent Christian emphasis upon Goodness. Mediating and contributory values of Love, Freedom, breadth and depth of Self Expression, and Service inevitably command our greatest attention. One who has his eyes exclusively on the goal inevitably stumbles over some object in the foreground. The ultimate goal must, nevertheless, be known and viewed from time to time in order to get sense of

[1] Adapted from "Homes Equipped for Children," *Proceedings of the Tenth National Conference on Housing, National Housing Association.*

direction; and then attention may safely and wisely be concentrated upon the objects which lie in the path just ahead.

With our goal in mind the function of the home is to serve as the initial and chief training center of human beings during the most impressionable years of their lives. Here they learn the often difficult lesson of accommodating their interests to those of others. Here chiefly they acquire those interests which dominate their lives. Here they may grow in wisdom, as well as in stature, and acquire an appreciation of life's values and receive their apprenticeship in the cultivation and creation or development of knowledge, of beauty, and of character.

The homes in which our future citizens are to grow up must first be judged with reference to standards of safety, healthfulness, convenience and comfort. An unsafe home cuts life short or handicaps the child's development. A home that is unsafe, or insanitary, or inconvenient, or uncomfortable, may produce such constant irritation that life's energy is focused chiefly upon annoying details rather than upon fundamentals. It is indispensable that parents as well as children should be relieved of needless irritations and drudgery. For, the attitudes of parents are imitated by or reflected in the life of the child and may preclude wholesome rounded development.

The first essential is that every growing child should be able to grow up in a private dwelling, located in a convenient, quiet, attractive and wholesome neighborhood. No tenement or apartment, even in the so-called "model" class, can meet as well the deeper needs of childhood—though it is admitted that such buildings may often be entirely adequate for families in which there are no children.

The reason for insisting upon a private dwelling, preferably detached, is that it can be made to provide sunshine and cross ventilation for every room, and thus a maximum of the life-giving forces which Nature affords. It also makes possible much more of privacy, independence and self expression than are afforded by the multiple dwelling.

It makes possible also a backyard for play, and space for a garden, which are among the fundamental requisites of early childhood. Home ownership further facilitates coöperative activity for common ends on the part of all members of the household, providing an apprenticeship in coöperative social living and in citizenship, which is almost always missed by the dwellers in the tenement or apartment districts of our cities.

Safety requirements of children involve adequate protection from fire and accident. In building a private dwelling sound construction and ade-

quate fire stopping must be taken into consideration. Small children should not be obliged to sleep on a third floor which has only one means of egress. But assuming that the house is safe and built in conformity with the Veiller Model Housing Law, and that there is sound construction so that there will be no danger from falling ceilings, insecure railings and broken treads or boarding, there should still be certain additional requirements for the safety of children. These would include a low handrail on steep or winding stair-cases—such as may be found in old houses—a gate at the top of each flight of stairs where there are very young children, and screens around the radiators and fireplaces to prevent burning.

To provide for the health needs of growing children their bedrooms and play rooms should be adequately sunned and easily aired. No house is wholly satisfactory which does not have double exposure for each room; for, otherwise, the air will become pocketed and stale. Sunshine is the cheapest and most effective germicide and fortunately reaches the floor, which is the area inhabited by the infant; dust is thus sterilized. But sunshine also contributes greatly to cheerfulness and to efficient metabolism and glowing health.

Children at all ages also should have the advantages of a sleeping porch or sun porch, and of a backyard in which to play. The health values of outdoor play are sufficiently obvious. Safety requires that the backyard should be fenced—at least until the children are of school age—unless many backyards are thrown together and a play director put in charge of the play activities of all children. The fenced backyard makes it possible for the mother, while engaged in her work in the kitchen, to supervise her children's out-of-doors play and choose their play associates. But the apartment house child is condemned to play altogether indoors or else to run the physical and social risk of playing on the street out of sight of its mother.

The health and safety of children have received more attention than their convenience and comfort. Our homes and furniture have been built for grown-ups rather than for children. To the infant who is just beginning to toddle, each room is a forest of table legs and chair legs, with many tempting articles just beyond reach. His convenience and comfort are not provided for, unless there is a comfortable low chair, stool or hassock for his use in each room of the house.

In the dining room he is especially handicapped. Dr. John M. Gries in his admirable article on "Homes Equipped for Children" in the April, 1927, issue of the *Child Welfare Magazine*, writes graphically on this subject in the following words:

. . . . In the dining room it is undoubtedly preferable to have things high, especially drawer knobs and door handles. Some children never meddle, and others in the same family cannot be kept out of mischief. But just as they should have their small-sized rockers in the living room, so should they have dining chairs of the proper height. In some families the children eat at a side table. This may be low with chairs to correspond, or it may be full height. In this case the problem is the same as if they sat at the table with the grownups. They too often graduate from the high-chair directly to a dining chair with the addition of a hassock, box, or dictionary to raise their eyes above the level of the table. But this is an awkward and inconvenient arrangement, and long before the child is large enough, he is using the same height chair that his parents use. From that time until he is grown, he is told at every meal that his table manners grow worse every day, and that he eats worse than he did when he was a baby. This may be true. A man or woman who can conduct a spoonful of soup or eat meat from a plate on a level with his or her chin, and not look like a cartoon might be qualified to criticise a child's awkwardness. Poor table manners are often directly traceable to low chairs, while knives, forks, spoons and tumblers too large for small hands come in for their share.

There are many other things we should do for the child's comfort, and for the parents' as well. A hall closet, which can be reached without going through any room, is indispensable for outdoor things. A colleague of mine has a rather large family; to take care of the problem of overshoes, he built a box in his closet with a compartment for the overshoes of each child and with the child's name properly attached on top of his own special cover. The bottom of that box was so designed that it could be removed, making it possible to clean it out periodically; for the overshoes were usually muddy when thrown into the box.

There are many expedients of that sort which are useful and save an immense amount of time and worry and, perhaps, quarreling. Low hooks are also important, otherwise the child will jump for his coat and probably break the hanger and perhaps tear the coat, or will throw it down on a chair or on the floor rather than hang it up, if the hook is not within easy reach.

There are other inconveniences; bathroom and kitchen fixtures are too high for small children. A movable box seems to be the only expedient—unless one can afford to put in a special bathroom for children or a special place for children to wash in the kitchen—a box so constructed that it will be safe for the child and can be easily put out of the way while the child is at school.

The next desideratum is an adequate place in which to play and to keep one's prized possessions. When parents say that children are always

underfoot, it is usually because no adequate provision has been made for this fundamental need of childhood.

Play is a child's chief means of experiencing life at its best and of training for adult living through experimental verification of life's values. The best of play gives scope to imagination, develops independence and resourcefulness, and ability to do an ever increasing number of things and do them well. It is important that such constructive opportunities should not needlessly be interfered with.

This means that the battalion of tin soldiers, or the sand village or the electric train, must not be torn up every night; but allowed, within reason, to be ever expanding projects, until abandoned from lack of interest. This rule is consistent with orderliness—which can be taught simultaneously—but with a minimum of interruption of the project. Low drawers and cupboards within the child's reach are essential to store away all toys with which he has finished; and, of course, such drawers must be so designed that they may be opened easily and closed by the child himself. If the family cannot afford a playroom, a corner of some other room may be consecrated to this use. This playroom for growing children may be converted into a study when they reach high school age.

Another essential is a workshop where there can be a work bench and shelves and an adequate assortment of tools to construct all sorts of things in which the boy—or tom-boy girl—delights. That workshop should be either in the basement or attic in the city home. In the country there are sheds and barns which can be used, but the city boy is not so privileged. If it is in the basement, it should be well sunned and dry. Here the son will serve an apprenticeship to his father; or, rather, they will work coöperatively in the pursuit of a common interest—a vastly important thing. For, since the passing of the guild system—ever since the industrial revolution—the boy has been deprived of an opportunity of association with the father in his work. And in the present generation the daughter may be deprived of association with her mother in the housework of the family—due to the ever increasing cramping of the kitchen and the multiplication of outside interests for the child.

In addition to the workshop, there should be the girl's sewing corner, or corner where she can keep her doll nursery when she is quite young. Studio equipment for drawing or painting is also essential. Low bookshelves which will hold the oversized books of the small child also are desirable, as such books can seldom be accommodated in the family library.

Of course, an open attic is the delight of any child's heart and makes

possible more extensive play operations than any ordinary playroom would afford. The rural child is still more blessed because the sheds, barns and stables each add to the scope and fun of his play. But, unfortunately, in this generation many children have to be deprived of the joys of living in the country—at least during nine months of the year.

If we paid more attention to the most fundamental of all housing problems, that of industrial and residential decentralization, we would have much more opportunity for providing these essentials for children. No problem in the entire field is so important, to my mind, as that of persuading industries to move out of our cities and of building suitable residences in Garden Suburbs nearby.

The single-family suburban house makes possible a backyard and garage which will partly take care of these fundamental needs of children. The backyard can provide for all ages—from the youngest to the eldest—and its equipment may range from the sand box of the younger children to the targets for archery or the basket ball cages supplied for those who are older. Swings, seesaws, horizontal bars, standards for high jumping and apparatus for bean bags, quoits, clock golf or croquet can be provided in a relatively small space.

The book entitled "Home Play," issued by the Playground and Recreation Association of America, shows how the equipment for both indoor and outdoor play can be made at home at minimum cost. During Better Homes Week of 1928, the Better Homes Committee of Erie County, in coöperation with the Recreation Division of the City Planning Commission of Buffalo, arranged for a demonstration of home playground equipment made in the homes of the city and also showed such equipment in use. Similar demonstrations have been conducted in scores of other cities during Better Homes Week through the coöperation of public recreation departments with local Better Homes committees.

The more fundamental needs of childhood—safety and health and convenience and comfort—have been examined. These are vastly important and the basis on which our superstructure must be built. But the child must also have continuous access to Truth and Beauty and Goodness.

There should be opportunity for close association of children with their parents. Every home needs a library—not just one book, as a friend of mine found in a house which he rented, furnished, in Washington. Original drawing and painting should be encouraged on the part of children at all ages.

As for goodness, it is everywhere within reach; but the family should

recognize the need of providing "temptations to be good." A settlement worker once inquired of me, "Why is it that the bad is so interesting and the good so uninteresting?" It is because the good has been wrongly presented. Coöperative activities on the part of the parents and children will give them an opportunity to know each other very much better and to share their interests, their knowledge and their wisdom.

One of the chief essentials for development, in both wisdom and goodness, is privacy. Every child should have a room of its own. Though serious harm may not be done by having the sons of the household sleep in one room, and the daughters in another, when those rooms have adequate ventilation, the practice is likely to interfere with sleep, which is one of the essential factors in the production of good health. A restless child will keep its roommate awake and the one who retires last or rises first may cut short the other's sleep. This is perhaps less serious in the case of the congregate sleeping porch because sleep there is more sound and the conditions are much more favorable to health.

Wherever possible the child should have a room of its own where it can work and play without interruption. Independence, resourcefulness, and individuality are essential for most effective living, but their development is interfered with seriously by the necessity of enduring frequent interruptions.

The need for privacy becomes still more apparent when the child reaches the age when it must bring home lessons from school. The concentration which is essential to success in intellectual pursuits can be developed by some in spite of confusion and interruption, but, probably, all children would be better off if they could do their lessons in complete privacy.

It is erroneously assumed that education and schooling are synonymous. But if children are to be trained to an efficiency greater than that of their parents they must have opportunity not only to solve their school problems in privacy, but also to read widely, to make things, to paint or sketch; and, wherever such Oriental values are possible in this crowded materialistic civilization of ours—to meditate.

Many a child probably misses life's deepest spiritual values because of the fact that it has no opportunity for intimate discussion of the deeper spiritual and moral problems of life with either parent except when other children are around—"listening in." The deepest moments of life are inevitably solitary and the child that does not have privacy may develop into a stereotyped adult personality, crowd-minded, uninteresting and devoid of the attributes which make for moral leadership.

Homes equipped for children must therefore provide the equipment and facilities which make for safety, health, convenience and comfort. Comfort and convenience must be construed in terms of the child's age, size and interests.

But if we aim to develop all innate capacities in our future citizens and to give each one the opportunity to develop all of his given latent abilities, we must not be content with mere health and comfort; but must provide conditions favorable for intellectual, moral and spiritual growth.

Character is set by home conditions. Few are able to surmount such conditions. Practically all of the impressions of the first six years of life come from the home; and, in the subsequent years, from one-third to one-half of the life of the child is spent in the home environment. Moreover, the child is in that environment during the most impressionable hours of the day, namely, the early morning and late evening.

Unless therefore it has privacy and is surrounded with opportunity for self-development, it may never develop broad interests, the habit of working things out to their logical conclusion, resourcefulness, or depth of inner life. But if provided with the environment which we have outlined and with wise parents, creative living becomes possible.

SUMMARY

It is well to consider the following objectives in planning a house: (1) Amount of money to be spent; (2) health—good circulation of air throughout, cross ventilation, and sunlight in all rooms if possible; (3) comfort and convenience—easy access, particularly between living room and dining room and dining room and kitchen, convenient location of bathroom, built-in furniture and equipment, proper placing of stationary equipment; (4) needs, activities, and desires of individual members of the family; (5) privacy; (6) beauty—simplicity, well-proportioned rooms, pleasing outlook, views and vistas.

The plan and exterior of the house should be developed together and each should express the other. The architectural style is governed somewhat by the house plan, for any style cannot be built around any plan. The plan in turn is governed somewhat by the building site. Consider furniture placement while planning the house, particularly in small houses. Provisions for the needs and desires of children which may be included with little additional expense should not be overlooked in planning.

In regard to the various rooms it is well to consider the following: (1) The living room should be sufficiently large to meet its particular

needs, provide for the placement of furniture, be well lighted and cheerful, with direct access to the dining room. (2) Bedrooms should be planned with cross ventilation, close to the bath, opening into a hall, and with sufficient wall space for a good location of the bed and necessary furniture. (3) The dining room should be no larger than necessary—three feet clear around the table is considered essential. Plenty of light and direct communication with the kitchen are important. (4) Kitchens should be planned around the operations conducted in them with no more floor space than is actually needed. Provision should be made for cross ventilation and easy access to dining room, front and back doors, telephone, and stairs to the second floor and basement.

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CHAPTER VI

COMMON BUILDING MATERIALS AND CONSTRUCTION PRACTICES

1. The Uses of Common Building Materials

THE IMPORTANCE OF GOOD BUILDING AND THE USES OF MATERIALS[1]

By C. STANLEY TAYLOR
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Whatever style of house may be chosen and whatever its magnificence or simplicity, the first essential is to build well and to be free from the annoyances and unnecessary expenses which may follow the use of inadequate or improper materials or methods of construction. It is rare, indeed, that an expenditure of twenty to thirty thousand dollars for a home must be spread out so thin that, in order to provide maximum volume, inferior construction must be tolerated. Ten thousand dollars will build the essential accommodations in bedrooms, living room, dining room and kitchen which are needed by the average family. An expenditure of double this amount obviously introduces considerations of quality construction, and even of elements of luxury.

In this age of rapid change in which families frequently move about from place to place a number of times within the life of a single generation, the question very naturally arises as to whether or not it is worth while to build with an eye to permanency. A century or two ago homes were built to endure because there was every expectation that the family would remain in the original homestead, not merely for a single generation, but for many succeeding generations. It is interesting to note that homes built with this idea in mind have actually survived the vicissitudes of time and stand to-day, venerated for their design and for their superior construction. It is only when men began to build poorly that America became besmirched with ugly structures, which not only deteriorated rapidly but became out of style before a single generation had completed its brief span of life.

To-day there are other reasons than the expectation of establishing a

[1] Adapted from "Building for the Future," *Country Life*, April, 1929.

permanent homestead which warrant—in fact economically compel—durable construction. The first of these is the costliness of modern building, due to high labor costs and to the fact that the modern home demands many relatively expensive conveniences and luxuries of which our forefathers never dreamed. A second factor is the cost of maintenance. It can be easily demonstrated that over a period of years the expenditures for keeping a poorly-constructed house in suitable condition are greater than the added initial expenditure required to build well. A third factor, involving architectural design, is obsolescence. Buildings which are competently designed and well executed do not lose in style nor cease to be of value. Good architecture survives style fads just as the paintings of the old masters have not lost any of their value with the advent of the modernist schools. The comparison to paintings may be further extended because it is readily appreciated that a painting may be excellent in composition, color, and theme and still not be satisfying unless its technical qualities are on a high plane. So with buildings. They may be well designed, appropriate to their locality, and yet fail to retain their appeal if they are executed in poor materials and with inadequate workmanship.

Obsolescence destroys value far more rapidly than ordinary wear and tear, and under present conditions of building cost it is gross extravagance to invite obsolescence, either by incompetent design or poor quality construction. With these thoughts in mind, it is well to give some serious consideration to the various structural materials that are suitable for enduring homes. It may be noted here that this discussion will necessarily cover all types of materials, because each type is durable if suitable grades or qualities of materials are employed and are used intelligently. It is thus not the material that is so important as the manner of its use and the selection of grades which have the necessary qualities for fine residential construction.

Wood construction has long predominated in the building of homes, not only in this country, but all over the world where timber has been available. Wood has endured not alone for generations, but for centuries. Compared to other types of materials, it is still relatively the least expensive in this country. When used in the form of solid timbers in the old manner or when hewn and carved and carefully detailed, it may actually be more expensive than other types handled in a more commonplace manner. The advantages of wood hardly need repetition, but certain features should be pointed out because they are seldom considered. When employed as a structural material, wood has higher insulating properties

than any form of masonry. An inch of wood is roughly equivalent, as an insulator, to six inches of solid brick masonry or concrete, and nine to ten inches of solid stone masonry. For this reason, frame construction, with a tight wood sheathing on the walls and roof, a layer of building paper, and an outside surface of clapboards or wood shingles, will be as warm in winter and as cool in summer as a masonry house with much thicker walls and of correspondingly higher cost. Furthermore, wood is easily handled and worked, and competent craftsmen can be more readily obtained for this material than for any other, all of which contributes to economy. Even unpainted wood of certain types will withstand weathering action for years, as witnessed by the fine old Colonial homes on the eastern seaboard which have never felt the touch of the painter's brush. However, paint, or some type of preservative stain, is nowadays universally employed on wood construction. It adds to its permanency and introduces opportunities for the use of colors not obtainable on masonry surfaces.

Certain precautions are necessary with wood construction to secure durability and freedom from maintenance expense. These include the proper ventilation of inclosed members to prevent dry rot, the elevation of wood members above ground level on a suitable dry masonry foundation, and the employment of well-seasoned timbers and boarding of those woods which time has demonstrated will last indefinitely. Exposed woods should be painted or treated with a preservative which should also be a stain, and of course the paint itself should be renewed from time to time to restore its fresh appearance.

Turning to the masonry types of construction, the first which warrant attention are those adaptable for use with a wood frame. These include both brick and stone facings and stucco applied over wood. These materials, when used in conjunction with a wood frame, depend for their permanency on the structural frame rather than upon their own inherent qualities; hence the things that have been said about wood apply with equal force to these types of construction, with the exception that the masonry facing introduces fire resisting qualities, eliminates repeated painting, and changes the entire appearance of the structure to one of solid masonry construction.

Brick construction is eminently suitable for all types of dwellings and is the oldest of the synthetic structural materials that mankind has developed. Brick walls are built in a number of ways, beginning with the use of a brick facing over frame, which has already been mentioned, and including a brick facing backed by hollow clay tile, hollow brick walls

(constructed by turning the brick on edge and leaving a hollow space between the wythes) and solid brick construction, in which the entire wall consists of only brick and mortar. Various qualities of brick construction are possible, depending upon three elements. The first is the quality of the brick itself, which may range from the soft types of common brick through the durable, hard-burned common bricks, to the almost vitrified face bricks. The second is the quality of construction, including the mortar and the method of laying. Moisture will penetrate through a brick wall eight or even twelve inches thick during driving rains if the mortar is porous and poorly used, and particularly if the bricks are not thoroughly embedded in mortar, leaving gaps in the mortar joints where water can collect. The third factor is the weight and thickness of the wall.

The weather tightness and durability of the brick wall are actually more dependent on the workmanship and the mortar than upon the brick, for almost all kinds of brick will withstand weathering for centuries. The choice between common brick or face brick is purely a personal matter and is influenced by the architectural style more than by considerations of quality, for the better grades of common brick normally employed for exterior facing have all the durability that any home building problem could ever require. The face bricks have their value in developing special colors and textures which cannot be obtained in any other material, and face bricks are usually more uniform in size than common bricks.

Hollow tile is an important structural material which is not given as much consideration by home builders as it deserves. Usually hollow tile is used as a backing material with some form of masonry surfacing, either stucco, brick, or stone. A hollow tile wall is fireproof, light in weight, comparatively inexpensive, and has great insulating value due to the air spaces between its faces. The most common type has a surface especially prepared to receive stucco and this type of construction is exceedingly durable; it is usually considered superior to stucco over a wood frame. Hollow tile is also used with a brick facing and this is generally somewhat less expensive and lighter in weight than walls of solid brick.

The manufacture of cut stone for use as a facing material has been developed in recent years and now is sufficiently economical so that a limestone or marble structure is not an extravagance. When these materials are used, hollow tile is generally employed as the masonry backing to carry the building loads. Hollow tile is also manufactured with a face texture resembling that of face brick, and when cleverly handled, makes an unusual wall of distinctive character. The larger units require some-

what different handling of the façade than would be customary with ordinary sizes of face brick, but a number of architects have achieved very successful effects based upon the optical illusion produced by these units. The effect, generally, is to diminish the apparent size of the structure because our eyes are accustomed to the smaller sizes of brick as a unit for estimating the scale of a building.

Concrete block is the next material which must be considered. Unfortunately, a few years ago the manufacturers of concrete blocks severely

FIG. 24.—Better Homes in America demonstration house. Stone is a satisfactory building material even in small houses if a suitable setting is provided.

injured their own industry by attempting to reproduce the appearance of a rough stone facing in an artificial material, with the result that concrete block came to be considered as an inferior substitute of exceedingly ugly character. Structurally, the hollow concrete block is excellent and its more general use is warranted. It may be employed like hollow tile as a backing for stucco, brick or stone. A few daring architects have recently discovered that concrete block, produced with a smooth clean face with square or even slightly chamfered edges, can be laid up to make a very interesting wall, especially if whitewashed. George Washington's home at Mount Vernon used wood, on the river-front side, shaped to resemble cut

stone in large blocks. The same effect is accomplished by the use of hollow concrete blocks, with either flush or recessed joints, and the effect of whitewashing is to restore an old Colonial or Georgian character which is quite suitable for country homes.

Among the remaining structural materials for fine dwellings are reinforced concrete and steel. Reinforced concrete has been little used for this purpose because it is unnecessarily strong for the light loads of a dwelling. Its extreme permanency and fireproof qualities make it desirable for the larger country estates, which will house valuable furnishings and works of art and which are so isolated as to require the utmost fireproof protection that can be obtained. When reinforced concrete is used for the structural frame and exterior walls, it is usually employed also for the interior structural members, including the floors and even the roof.

Steel construction is the newest development in the home-building field, and only recently has it become both practical and economical. Many attempts have been made in the past to adapt the skyscraper steel skeleton to residential buildings, but less than a year has elapsed since a completely practical method of doing so has been found. Now a steel-framed house can be erected rapidly and at comparatively low cost, using members made of light steel shapes exactly corresponding to the wooden members used in ordinary construction. One of the large steel companies has entered this field and is manufacturing the structural elements needed in homes of all sizes, and the system they have employed makes it possible for the architect to design without any serious limitations upon his dimensions, proportions or loads. In fact, the architect can design as he had been accustomed to with wood or masonry, and a steel frame can be fabricated for the home and delivered to the site before the foundations are ready. This development introduces the completely fireproof home in which all the structural parts are of noncombustible materials. The steel frame is used with an exterior facing material of masonry, such as stucco or a brick or stone facing. The structural floors are of concrete laid over steel beams, using a new type of reinforcing material that eliminates the need for forms in pouring floors. The interior partitions have steel studs and are plastered on either side, so that the structural members are fully inclosed. Usually some type of insulating material is employed on the exterior walls and roof, which may be a part of the stucco reinforcing fabric or may consist of any of the standard types of insulating materials which are generally used on the inner faces of the walls or between the structural members.

[NOTE.—In some of the larger cities of this country as well as in England steel frame houses have been erected. Steel frame construction will, it is believed, cut down considerably the length of time in building. However, every effort should be made in order not to standardize houses where large-scale production is applied extensively. *Pisé de terre*, known as rammed earth construction, and also adobe construction are two of the old building materials and processes which are still in use today. Adobe, which is a mixture of suitable clay, sand, and fiber (grass or roots), is used for the walls or is formed into brick. Adobe houses are commonly found in the southwestern part of the country and also in Mexico. For information on rammed earth construction see *Rammed Earth Walls for Buildings* (Farmers' Bull. No. 1500, U.S. Department of Agriculture).

USE OF WOOD IN HOUSE CONSTRUCTION

BY NELSON S. PERKINS

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Selecting a suitable wood for any building use, no matter in what section of the country it is to be used, affords an opportunity for an extremely wide choice of species and grades. How to restrict that choice in a practical manner for a particular job is the question before the architect, engineer, or builder.

The suitableness of a wood depends first on the use requirements, and then on the mechanical and physical properties such as strength, hardness, durability, and ability to hold paint, of the species and grades involved.

The two general divisions of woods are the hardwoods, from the broad-leaved trees such as oak, maple, birch, gum, and sycamore, and the so-called softwoods from the conifers or needle-leaved trees such as the pines, firs, cedars, spruces, and hemlocks.

This latter group furnishes the lumber for practically all house framing, sheathing, subflooring, siding, shingles, and window sash and frames, while hardwoods and also softwoods are used for finished flooring, woodwork and trim, paneling, and doors. In addition, oak and chestnut are used occasionally for exposed beams and trusses as in clubhouses, churches, and similar structures.

From the standpoint of volume used, by far the most important woods for building are the yellow pines from the South and Douglas fir from the Northwest. Practically all the softwoods, however, are used to some extent in house construction.

It is generally impossible to choose the "best" wood for any service, but one of the most suitable usually can be selected if we are familiar, not only with species characteristics, but also with the structure of wood.

WOOD STRUCTURE

Wood, like any form of plant life, is composed of minute cells. A tree grows in height and diameter through the formation of new cells, under the bark and at the tips of branches and roots. As new cells are formed in the outer portion of the tree, some of the inner cells mature or "die" and become filled with water and perhaps gum or resin or mineral matter. Only an outside layer of the wood around the tree contains live cells and constitutes what is known as "sapwood," while the inner portion, made up of matured cells, is the heartwood. This heartwood, in practically every species, is more durable, that is, more resistant against decay, than the sapwood. This explains why the heartwood is frequently specified for use in exposed locations.

Contrary, however, to what was once a popular notion, sapwood is just as strong as heartwood of the same species, other things being equal.

DENSITY

The growth which a tree makes occurs during the spring and summer months in the form of annual rings. In the spring the growth is rapid and the new cells are large with thin walls. In the summer growth is retarded and the new cells are smaller with thicker walls. The light spring wood and dark summer wood thus formed each year together make up an annual ring. The summer wood, having a thicker cell structure, has more wood fiber per unit of volume than the spring wood, and hence is denser and stronger.

Consequently the higher the percentage of summer wood in a piece of wood, the stronger the piece. In such woods as Southern yellow pine and Douglas fir, the percentage of summer wood is referred to as the density of the wood and is a definite grading requirement in certain structural timber grades.

GRADING

In 1925 under the auspices of the U.S. Department of Commerce the lumber industry after several years' deliberation adopted simplified practices published as *American Lumber Standards*. These standards, since revised and improved, constitute minimum basic provisions for manufacturing softwood lumber in standard grades. They are not purchase specifications, however, and should not be used as such. They have resulted in lumber producers adopting standard manufacturing grades under which, it is estimated, about 80 per cent of the softwood lumber now pro-

duced is graded. This means that the architect or builder can now specify lumber with assurance under a standard nomenclature and standard sizes. Moreover, the maximum defects, both as to size and as to number, permitted in similar grades for different species are as nearly alike as is practicable in view of the varying inherent characteristics of the different woods.

According to these *American Lumber Standards* softwood lumber is classified as yard lumber, structural material, and factory and shop lumber.

Factory and shop lumber are intended for millwork plants where they are remanufactured into various products, all serious defects being removed. Consequently it is of no special interest to the architect or the builder.

Structural material is lumber graded on definite strength values as well as on use of the entire piece. Not only are defects limited, but also the location of defects and the slope of grain—a most important consideration in any piece of wood to which engineering stresses are assigned. Its importance lies chiefly in its application for heavy timber construction in bridges, roof trusses, factory-type buildings, and such uses.

Yard lumber includes most of the lumber used for general building purposes. It is defined as lumber less than five inches in thickness and graded in accordance with the number and size of defects, and also, except in the lowest grades, upon the use of the entire piece.

Yard lumber is divided into the "select grades" (of good appearance and finishing qualities and suitable for natural or paint finishes) and the "common grades" (suitable for general utility and construction purposes).

The *select grades*, used for such purposes as interior and exterior trim, siding, paneling, and finish flooring, are classified as follows:

A Select—practically clear lumber (free from defects)

B Select—has few minor blemishes or defects

Both of these grades are suitable for the highest type of work. In some woods the A select grade is not marketed as such, the best grade being known then as B and better and including the clear material which would otherwise grade as A select.

C Select—allows a limited number of small defects which can be covered with paint

D Select—allows any number of defects or blemishes that will not detract from a finish appearance when painted

In general, the A and B select grades are intended for "natural" finishes, where for decorative purposes it is desired to have the grain of the

wood visible. The C and D select grades are best adapted for painted finishes which will cover the minor defects permitted in the grades.

The *common grades* are produced in both "boards" and "dimension."

Boards include lumber less than 2 inches thick, and may be square edged or worked to a pattern in such items as siding, flooring, and ceiling, for which the select grades are also widely used.

Dimension, used as framing material in such sizes as 2×4's, 2×6's, 4×4's, etc., is manufactured in only three grades: No. 1 common, No. 2 common, and No. 3 common. But, whereas the common grades of "boards" are based on their utility as a covering material, the common grades of "dimension" are based more on allowable defects affecting the strength and stiffness.

In general, No. 1 common lumber is sound and tight knotted—i.e., water tight. In dimension sizes it is widely used for floor joists, rafters, and other parts requiring strength and stiffness.

Number 2 common allows larger and coarser defects, but may be considered as grain-tight material and has other covering qualities. Number 2 common "dimension" is suitable and widely used for studs, plates, braces, etc., where the material is never stressed to its full capacity—in other words, for utility requirements. Number 2 common may also be used satisfactorily for floor joists if the span and loading are such that the strength of the joist will be ample and stiffness is the governing factor. In such cases No. 2 common will be more economical because it will provide practically the same stiffness as No. 1 common material, although not so much strength. Often it will be possible to use a larger-size joist in No. 2 common instead of in No. 1 common, thus getting equivalent strength but greater stiffness, without increasing the cost.

Number 3 common, in some species, is suitable for permanent construction for sheathing and subflooring. In other species, if No. 3 common is used, care should be taken to remove any serious defects or taint of decay.

GRADE-MARKING

The question arises, naturally, how to recognize any grade of lumber after you have ordered it. The answer is "grade marking." This plan, developed largely through the efforts of the National Committee on Wood Utilization and the National Lumber Manufacturers' Association, has for its purpose the stamping of each piece of lumber with the mark identifying its species and grade. The plan has been pushed aggressively by the more progressive manufacturers and their associations, and to-day grade-marked lumber is an actuality; it is obtainable in most species and grades

and in any locality, although as yet it is not always carried in retail stock. Grade-marking is the consumer's best protection, although lumber as now furnished under "certificates of inspection" from recognized lumber manufacturers' associations will be equally reliable as to species and grade.

DRY LUMBER

Thorough seasoning or drying of lumber is probably the most essential factor in obtaining satisfactory results from wood construction. Dry lumber should be demanded—but after it is received on a job, it should be protected from the weather. This is especially true of millwork.

Shrinkage in wood is caused by moisture drying out of the wood fibers, and expansion or swelling is caused by the fibers absorbing moisture. Obviously, if wood before being installed is dried or "seasoned" to the average moisture content that it will have in the building, the subsequent shrinkage will be minimized and, in fact, practically unnoticeable. Lumber for framing and exterior uses should be seasoned to a moisture content of from 14 to 18 per cent, while wood for interior uses such as trim, flooring, or paneling should be kiln-dried down to about 8–10 per cent. Moisture content is the ratio of the weight of moisture (and other volatiles) in the wood to the oven-dry weight of the wood.

DURABILITY AND DECAY

Dry lumber will not decay. Decay in wood is caused by attack of fungi which require air, warmth, and moisture. Dry lumber will not support fungus growth—one excellent reason, aside from its lack of shrinkage, for insisting upon its use in building construction.

When wood is used near the ground, or when subjected continually to moisture and dampness, as in the sills on the foundation wall, heartwood of the more durable woods should be specified, or else the material should be treated with a proved preservative such as creosote, zinc chloride, or other salt. The use of wood thus treated was formerly confined to bridges, wharves, and other heavy-duty services. During the past eighteen months, however, the National Committee on Wood Utilization has assisted in having treated lumber made available throughout Ohio and elsewhere for those parts of residence and light-frame construction mentioned above.

SELECTION

In specifying lumber, care should be taken to refer to the latest grading rules of the lumber manufacturers' association under which the particular

kind of wood desired is produced. In addition, insist upon grade-marked material to be assured of quality.

For further information the reader is referred to *Light Frame House Construction*, *Wood Construction*, and other publications by the National Committee on Wood Utilization, U.S. Department of Commerce.

BUILDING BRICK[1]

By JORDAN A. PUGH
Common Brick Manufacturers' Association

In this country, in recent years, there has been a revival of interest in the architectural details and history of many of the old brick buildings, and it is not infrequent for architects to specify old-style handmade bricks for special work in order faithfully to reproduce the spirit of these older structures. A great deal of literature relating to the history of brick has become available within the last few years, and many of these books are illustrated with beautiful reproductions of noted older buildings.

Modern brickmaking is done by machinery, the clay being ground, mixed with water, and forced through dies to make the required shapes. Some of the modern plants have intricate machinery for actually setting the brick in the kilns, and the finished product is in some localities loaded into large "containers" which are placed on railroad cars, unloaded onto trucks, and delivered at the site with the contents undisturbed.

The manufacturing process of firing bricks calls for temperatures of approximately 1,800° F., applied for from two to three and four days and even longer. This intense heat destroys all combustible materials, and the chemical composition of different clays, so treated, results in a wide range of colors and shades. Browns and reds predominate, but the colors range through grays, creams, buffs, yellows, tans, reds, pinks, and purples. Blues and greens are produced by the addition of chemicals. The textures are varied, being smooth by die finishes, rough by wire cutting, or by sand molding, or by the quality of the clay or shale itself, and there is also a wide use of "clinkered" or "arch" brick which are those slightly distorted or roughened on the face by the action of high heats. Such bricks are used in producing particular architectural effects.

This wide range of shapes, colors, and textures enables brick to be used in the construction of almost any type of building and in such a manner as to make the building harmonize with its surroundings. In recent years the painting of brick by cement paint is of frequent occurrence while an

[1] Prepared for this publication.

effect of aging is produced by whitewashing the brick, the whitewash being soon affected by the weather.

An intending builder, before selecting the brick for facing the house, should make certain that the brick will harmonize with the design and that the design will fit its environment. The individual who ordered a "glazed yellow brick for facing a Colonial bungalow" had somewhat scrambled ideas as to architectural requirements.

The selection of a mortar of proper color should also be carefully considered inasmuch as from 10 to 20 per cent of wall surface consists of the mortar. The mortar should harmonize with the color of the brick or properly contrast with it.

Brick masonry must be "bonded" together, that is, the individual brick units must be tied together at certain intervals by bricks laid in the opposite direction—such bricks being called "headers." There are many and varied types of bonding, and any standard work on brick contains full illustrations. Patterns may be easily worked out with brick and many may be found in pamphlets showing the design of brick fireplaces, chimneys, and other details.

Garden walks, steps, and terraces are frequently paved with brick in order to simulate construction usual in the larger Colonial estates, and there is also an increasing use of brick inclosure walls and retaining walls.

The use of salmon brick is recommended in lining chimneys—this because of the fact that these bricks are underburned and therefore will withstand heat action even more than the hard-burned brick. Salmon brick are also recommended as a "backup" material in constructing brick walls as they are more absorbent and therefore tend to absorb such slight moisture as might penetrate through the facing material joints. However, it is better not to try to use salmon brick unless the facing material is distinctly different in color. They should never be exposed directly to the weather, and this has at times occurred when the facing material was of the same color as the salmon brick.

The United States Bureau of Standards (Division of Simplified Practice), in coöperation with the American Institute of Architects and representatives of the brick industry, adopted the following dimensions as the standard of size for both common and face brick: Length, 8 inches; width, $3\frac{3}{4}$ inches; thickness, $2\frac{1}{4}$ inches, with permissible variations (plus or minus) of $\frac{1}{4}$ inch in length and $\frac{1}{8}$ inch in width and thickness. These variations are due to the fact that different clays shrink to different degrees according to the amount of heat applied to them.

As with all the other building materials, the principal factor in their satisfactory use in construction is necessarily "workmanship." A perfect building material imperfectly used would give imperfect results. In brick-masonry work when all horizontal and vertical joints are well filled with properly-mixed mortar the wall will give a satisfactory account of itself. Specifications for proper construction may be obtained from the various brick associations.

Roof members should be properly fastened to plates bolted to the tops of the walls according to the directions contained in association brick literature. When window and door frames are put in position the open spaces around them should be filled with mortar and the openings calked with suitable materials so as to prevent moisture penetration. It has happened that when these precautions are not taken water entered the walls at openings, and came through the walls farther away. In both frame and brick construction care should be taken to seal open spaces around the frames.

In case of flat roofs the "flashing" should be of sufficient height and should be carried through the parapet wall which should, preferably, have a coping of vitrified clay.

The danger from fire will be less if the furnace room is walled with brick and if the ceiling (over the furnace) is protected by some fireproof material. Chimneys should always be lined with flue lining and frame members should not be built into chimneys unless 8 inches of solid brick come between the members and the flue proper. This precaution should be taken to prevent a wood member from catching fire from heated gases which may escape from the flue.

All exposed brick walls should be properly furred before being plastered. The use of furring (unless it is of hollow tile) leaves an open air space between the brick walls and the plaster. This air space tends to insulate the house and make it dry and warmer in the winter and cooler in summer. When this air space is open it also would have a tendency to act as a flue in case of fire, so firestops should be inserted at floor levels to prevent the possible passage of flames up this hollow space. The same precaution is advisable in the construction of frame houses. A brick house properly designed and with a fireproof roof is practically immune from catching fire from an adjacent building, and is regarded from an insurance standpoint as the best class of risk.

In considering the heating of a house it should be borne in mind that while brick walls in themselves have a high insulating value, much of the

heat losses occur not through the walls themselves but through the window and door openings and by radiation through the window panes.

When construction calls for strong fireproof walls which will have a low maintenance cost and which will not deteriorate in appearance with age, brick naturally suggests itself for consideration, especially since the cost is relatively low, being merely the difference between the cost of frame and brick walls from the tops of foundations to the roof plates, the other items of construction being the same.

A renewed interest is being shown in "reinforced brickwork," the reinforcing being accomplished by inserting metal rods in the wall during the construction, on the same principle that rods are used in reinforced concrete. Investigations of older examples of this construction, and more recent experiments, indicate a wide field of usefulness for reinforced brickwork.

Brick being absolutely fireproof—having a wide range of colors and textures—requiring no upkeep or painting expense, and being of reasonable first cost, naturally suggests itself as a proper construction material for many projects.[1]

HOLLOW TILE AND CEMENT MATERIALS[2]

By ALLEN L. CHURCHILL

AND

LEONARD WICKENDEN

HOLLOW TILE

The advantages of hollow tiles for building purposes are so obvious that their growing popularity is in no way surprising. The air spaces in the tiles form a protection against damp, and against heat in summer and cold in winter; while the durability, low cost of maintenance, and fireproof qualities already mentioned in connection with bricks are possessed to an equal degree by hollow tile. Perhaps the ideal combination is that of a hollow-tile building with a brick facing. This gives the desirable insulation against dampness and extremes of temperature possessed by

[1] Full details relating to the colors and textures of brick and information relating to all phases of its use in construction may be had on application to the Division of Building and Housing, U.S. Department of Commerce; the American Face Brick Association, 130 N. Wells St., Chicago; and the Common Brick Mfrs. Association, 2121 Guarantee Title Bldg., Cleveland, Ohio.

[2] Adapted from *The House-Owner's Book* (New York: Funk & Wagnalls, 1928), pp. 32–42.

hollow tile, together with the architectural effects of brick. It is, also, possible to obtain a special type of hollow tile having a face similar in character to the ordinary brick, and, with this type, effects very similar to those obtained with face brick can be produced. The commonest finish for a hollow-tile house is, however, stucco.

. . . . [Hollow tile] should be free from cracks and well burned, especially when used for outside walls. . . . . The relative size of voids and shells is also of some importance. The void should not measure more than four inches in width and the thickness of the webs and shells should not be less than fifteen per cent of the width of the void. Where hollow tile is used for inside partitions, it is not necessary to be quite so particular regarding quality.

As regards the cost of hollow tile, the general public, as in the case of brick, has an exaggerated idea of the expense involved. Moreover, the slight extra cost over frame construction is usually more than offset by the saving in repairs, painting, insurance and in fuel.

STUCCO

Stucco is a cement plaster, consisting of cement and sand, or cement, sand and lime, mixed in varying proportions and applied to the outside of a building either for decoration, or protection, or both. . . . . (For additional information on stucco, see pp. 221–24.)

CEMENT AND CONCRETE

Portland cement is made by heating a mixture of limestone and clay (or similar materials) in a kiln to such a temperature that fusion takes place and clinkers are produced. These clinkers are ground to a fine powder, and are usually mixed with about three per cent of gypsum. The resulting powder consists chiefly of calcium and aluminum silicates. On mixing with water, these compounds combine with it, chemically, forming hydrated silicates of calcium and aluminum.

Lest it should be thought that an unnecessary incursion is being made into pure chemistry, it may be said that a thorough understanding of the statements contained above would enable the amateur to avoid more than half the failures which follow his attempts at concrete construction. If you contemplate working with Portland cement, even if only to the extent of closing a crack in your cellar floor, grasp the fundamental fact: The setting of concrete is *not* a process of "drying out"; it is the exact opposite—a process of hydration. Unless sufficient water is present concrete

will never, *can* never, set really hard and solid. Moreover, the setting is, in reality, a very slow process, and concrete seldom reaches its maximum hardness in less than a year. It is, however, during the first few days that a sufficiency of moisture is so important, and after the concrete is mixed and poured into the forms steps must be taken to keep it damp. It should be protected with canvas, wet sand, or some other simple covering, and both concrete and covering should be sprinkled with water sufficiently often to keep the whole mass thoroughly damp for some days.

As regards the amount of water to be used in making up the mixture, this will vary considerably according to the condition of the sand and stone mixed with the cement. When the sand is very dry, more water will be needed than when it is wet. The exact amount of water required, therefore, is seldom given, and it is almost entirely a matter of personal judgment. This frequently presents difficulties to the amateur, and he nearly always errs on the side of insufficiency. He finds it difficult to believe that the sloppy mixture which he has prepared will ever set to the hard, stone-like mass which he aims to produce, and he adds a little more cement to "stiffen it up." This is often a fatal mistake and results in a soft concrete. The consistency which gives the best results is that of a jelly. The mixture is sometimes described as "quaky," which means that it will "shiver," just as a jelly does when it is jarred. It should be neither thin and watery, nor yet so stiff that it will not flow.

Concrete is a mixture of cement, sand, pebbles, or small stones, and water. All four constituents may be considered equally important. Cement is manufactured under strict chemical control, and if you buy any of the well-known brands you may have absolute confidence in its quality. The important part played by water in concrete construction has already been indicated, and on that point little more need be said, except as to the quality of the water. One authority on concrete has made the statement that water that is good enough for concrete is good enough to be drunk. This may be carrying things a little too far, but it is necessary that the water should be clean and free from suspended matter.

The importance of having good quality sand and stone is apparent. Concrete may be looked upon as a mixture of these two materials bound together by cement. It follows, therefore, that if the sand and stones are soft and weak, the whole mixture will be soft and weak. Do not use sand that powders easily when rubbed, or that contains appreciable amounts of clay or other impurities, and choose pebbles that are hard, clean and smooth, or broken stone from granite, trap-rock, or other hard rocks. If

sand or stones of this description are not available, make the best of poor material by washing it thoroughly before use, so as to remove the clay and other foreign matter.

The proportions of sand, stone, and cement recommended vary considerably according to the work to be done. An average mixture which will be found suitable for most work around the home consists of one part of cement, two of sand, and four of gravel or stone. This is known as a 1:2:4 mixture, and the proportions are given according to volume—not weight. For foundations a $1:2\frac{1}{2}:5$ mixture is frequently used, and in the construction of roadways a $1:1\frac{1}{2}:3$ or even $1:1:1\frac{1}{2}$ mixture is preferred. The general rule, in this connection, is that the greater the proportion of cement the more water-proof and dense is the concrete, and, up to a certain limit, the greater the proportion of sand and stone, the stronger is the concrete. There must be sufficient cement to produce a thorough coating of the sand and stone, as there will not be otherwise a perfect bond between the different particles constituting the mixture. For the same reason, the concrete must be very thoroughly mixed before use. For facing walls, filling cracks and making repairs, generally, a mixture of cement and sand, only, is used, usually in the proportion of 1:2.[1]

STUCCO FINISHES[2]

a) *Classes.*—The finish coats of stucco may be divided into three general groups according to the texture and method of application. These are, first, dash finishes of the wet and dry type; second, the smooth finishes comprising the various modifications of the float finish; and, third, the exposed aggregate or surface treated concrete.

b) *Wet dashes.*—The wet-dash finishes include the "rough cast" or the "pebble dash," which is obtained by throwing with a paddle a mixture of cement grout and pebbles of a definite size against a fresh coat of mortar. The "spatter" dash is obtained in very much the same manner as the rough cast except that a very thin mixture of cement and coarse sand or stone screenings is dashed against the fresh mortar. The "sand spray" or "broom dash" is obtained by applying a creamy mixture of cement and

[1] For additional information on concrete see *Design and Control of Concrete Mixtures* (Portland Cement Assoc.).

[2] From *Stucco Investigations at the U.S. Bureau of Standards with Recommendations for Portland Cement Stucco Construction* (Circular of the Bureau of Standards, No. 311, 1926), pp. 27–32. See this publication also for uses of stucco for construction purposes, mixing and application, maintenance, and other information.

sand with a whisk broom or a long fiber brush. The broom is dipped into the grout and then struck across the forearm or a stick held in the left hand, spraying the mixture on the finish coat of mortar.

All these finishes are of comparatively low cost and are readily executed by workmen of ordinary skill. Owing to their rough texture they have the advantage of hiding the fine shrinkage cracks which develop to a greater or less extent in Portland cement stucco on hardening. These features contribute to the widespread use of the wet-dash finishes, and for the usual run of stucco work they are recommended.

There is considerable objection to the wet dashes because of their dull and cold uniform cement color. This objection may be met by using the white cement in the finish coat and dash or by tinting with mortar colors.

c) *Dry dash.*—The dry-dash finishes are generally obtained by throwing with considerable force clean pebbles, stone chips, or pieces of shell against the finish coat before it has hardened. The aggregate should be largely of one size and should be uniformly distributed over the surface. The pieces may be pushed into place by the use of the float, but there should be no rubbing of the surface after the pieces are embedded. This finish is quite difficult to execute properly, but when well done it produces an acceptable color and texture quite different in character from those of the wet dashes.

d) *Float finishes.*—The sand-float finish is produced by carefully floating the finish coat after it has taken its initial hardening. A lean finish coat is necessary, and it should be carefully straightened before floating is started. After the stucco has well stiffened, water is dashed on it by means of a brush and the final floating carried out until the sand tones predominate. It is probably the most difficult of all the finishes to execute and obtain acceptable surfaces. As the surface is smooth, imperfections of workmanship and defects show very conspicuously, and this finish should only be undertaken by workmen with considerable skill and experience.

e) *Textures.*—In order to obtain finishes of a pleasing texture and to avoid the monotony of the dashes and the difficulties of execution of the float finishes, a number of finishes have been developed by specialists and manufacturers of colored stucco. Color tones are introduced, and with combination of colors and methods of finishing there are unlimited possibilities as to number of surface effects which can be devised. One of these finishes has been named "floated rough cast." The wall is prepared for a rough-cast finish, and then the high points are lightly smoothed off with a

plasterer's wood float. This finish lends itself readily to a two-color combination. First, the finish coat of one color is applied and partially floated and while still plastic another color is dashed on and then the high points smoothed off and the two colors blended together. Another has been called the "sponge-float" finish and is produced by carefully working the plastic finish coat with a softwood float drawing the float away from the

FIG. 25.—This six-room house built of hollow tile walls with an exterior finish of stucco is comfortably placed on a 45-foot lot. (Copyright—Architects' Small House Service Bureau, Inc., Plan 6-B-27.)

surface at random. The suction between the float and the stucco gives a roughness of surface which is between the extremes of the roughness of the wet dashes and the smoothness of the sand-float finish. When executed in colored stucco, it gives a very acceptable finish.

f) Exposed aggregate.—Although the name "exposed aggregate" has been applied to the ordinary troweled or floated surface which is given a final scrubbing treatment with brush and water or a cleaning with an acid wash, the name will be used here in connection with a finish which should be more properly designated as a surface-treated concrete. The exposed aggregate finish is obtained by applying a finish coat which in itself

is a concrete with miniature aggregate. The cement and fine sand bear a definite relation to the coarse aggregate which predominates the mix. The coarse particles have to be sized and proportioned to the fine material in keeping with the architectural features of the building and in accordance with the effect which it is desired to produce when the structure is viewed from a given distance. Usually the coarse particles are of one size from $\frac{1}{8}$ to $\frac{1}{4}$ inch and upward and are proportioned into the mix to give a maximum density. This coating is applied and after it has stiffened the surface film of cement and finer aggregate is removed by gentle brushing with a wire brush and then the coat is left to harden and dry out. Next, it is washed with dilute acid and clean water. By removing the cement and fine particles the color of the surface is determined by the color of the aggregate and its texture by the size and shape of the coarse particles.

While this treatment ranks first as a stucco finish, it is also the most difficult of stuccowork to plan and execute. By the use of colored aggregates the most beautiful of color tones can be obtained and due to its density and texture many of the common structural defects are eliminated. To carry out the work successfully requires the selection, grading, and proportioning of the aggregate from a knowledge of size effect and color tone, and to obtain a uniformity of appearance over the entire surface requires the highest type of workmanship in the application and finishing of the coat.

FUNDAMENTAL REQUIREMENTS OF CONCRETE[1]

Concrete is a mixture of Portland cement, water and inert materials put in place in a plastic condition but hardening soon after due to the process known as the hydration of the cement. Although concrete is placed in a plastic condition and cannot be tested for quality at the time of fabrication it is now practicable to produce concrete of any quality that may be necessary to meet the requirements of the work by proper control of the proportioning, making and placing together with subsequent curing.

The fundamental requirements of hardened concrete are strength, durability and economy. Fresh concrete must be workable, that is, it must be of such a consistency and physical make-up that it can be readily placed in the form without segregation of the materials and without requiring an excessive amount of spading to completely fill the form. Uniformity in both the fresh and hardened concrete is necessary to secure economy of materials, to facilitate handling and placing and to obtain uni-

[1] From *Design and Control of Concrete Mixtures* (Portland Cement Assoc., 1929).

formity in the completed structure. It is particularly important where watertightness is required.

Most concrete is designed on the basis of compressive strength. However, the flexural and tensile strength, the bond with steel reinforcement, and the resistance to wear are in general governed by the same factors which govern the compressive strength. The compressive strength, therefore, may be used as an indication of these other qualities and, since the test for compressive strength is comparatively simple, it is the test that is most often adopted.

If structures are to give long service, the durability of the materials is just as important as the strength. In much of the past practice this has not been fully appreciated and too much emphasis has been placed on strength and economy alone. The most important requirement for durability of exposed concrete is watertightness. Durable concrete requires sound, durable aggregates thoroughly incorporated in a cement paste that is watertight.

While economy of materials is important, there are other factors affecting the economy of concrete which seldom receives proper consideration. The amount of labor required in placing and finishing concrete is a considerable item in the total cost. It can be reduced to a minimum by proportioning the materials to produce a plastic mixture that can be placed easily under the particular conditions of the job. The most economical concrete does not always result from the mix having the lowest cement factor nor the mix with the lowest cost for materials, but rather from the mix for which *total* cost—materials, handling and placing—is the lowest.

The *workability* required will be different for different classes of work and will be determined by the methods of transporting and the details of placing—width and depth of forms and spacing of reinforcement. Plastic concrete may be regarded as a mass of aggregate particles, individually floated in a cement paste. This gives a mass that can be transported without segregation and can be placed easily in such a manner that when the forms are removed the hardened concrete will have smooth surfaces, free from honeycombing. Concrete of such consistency will require a minimum amount of finishing. In much of the practice in the past, such concrete has not been obtained. This was largely due to the fact that arbitrary mixtures were specified which did not permit adjustments in the mix to suit the character of materials, the condition in which they were measured or the placing requirements of the job. In the endeavor

to obtain workable mixtures, excess water was often added which almost invariably resulted in segregation, porosity and low strength.

Uniformity is important since all parts of a structure designed for the same strength should be made of concrete of the same quality. Moreover, the best economy can be obtained only by the use of uniform batches of concrete. Uniformity is best secured by using plastic concrete made homogeneous by thorough mixing of uniformly measured quantities of materials, including the water.

The above fundamental requirements can be obtained by attention to each of the four major factors which determine concrete quality. These are the use of *suitable materials*, *correct proportioning*, *careful methods of production, and protection during the curing period. . . .*[1]

[Note.—The Building Code Committee of the U.S. Department of Commerce has recommended standard specifications governing the use of concrete units (see *Minimum Requirements for Small Dwelling Construction;* also *Properties and Manufacture of Concrete Building Units* [U.S. Bureau of Standards], for materials and proportioning).]

ROOFING MATERIALS[2]

By MATLACK PRICE

When it comes to choosing a roof the material may not, necessarily, depend upon the wall material or the style of the house. You may have such a keen preference for a certain kind of roof that you will choose a type of house that will allow you to use that roof. In other words, the relationship of roof to house is so important that the house itself may be radically changed in favor of roofing material.

There are several broad divisions that may serve to clarify a brief discussion of some of the principal roofing materials, as, for instance, fireproof and non-fireproof. Or, more exactly, the division into wood shingle, composition shingle, tile and slate.

Although brick, stone and stucco houses may be topped with wood shingle roofs, the all-wood structure most often calls for this material. Fireproof roofing materials, it is true, are often enough seen on the frame house, but not consistently, even if the roof is the part of any house most likely to catch fire. If fire hazard is a matter of real concern, there are plenty of artificial shingles, compounded largely of asbestos, and light

[1] For information on selection of materials, proportioning, production, and protection during curing period see *ibid*.

[2] Adapted from "Building and Equipping Your Home," *Arts and Decoration*, April, 1930. Reprinted by courtesy of the *Arts and Decoration* magazine.

enough in weight to conform with light frame construction and side-walls sheathed with clapboards or shingles.

Time was, of course, when shingles were split by hand, and it is only within comparatively recent times that wood shingles have been offered in extensive color ranges, thoroughly dip-stained before delivery. In these creosote stains, the factory job of dipping soon proved to be far more thorough and satisfactory than anything that could be done "on location," and it was not long before manufacturers of shingles were presenting complete ranges of really beautiful colors, so that attractive harmonies are now easily effected in both roofs and side-walls of the house entirely of wood construction.

Nature, left to herself, gives walls and roofs of shingle a weathered color of silver gray, but this color changes, becoming yearly darker and darker, until it is nearly black. One advantage of dip-stained shingles is not only the obvious one of achieving any desired color immediately, but also the advantage of permanence in the shingle itself as well as in the color. Not that wood shingles *au naturel* are not still used. They are, and with a constant demand for the hand-split kind, those large rugged-looking wood shingles that produce such authentic quaintness in the cottage type of house, and in certain kinds of Colonial adaptations.

Wood shingles are in no danger of being out-moded by other types of roofing—they will always serve well and faithfully, and treated with creosote stains they will also serve colorfully a large proportion of all the roofs there are.

A question often asked has to do with wood shingles, and this question is about the legitimacy of roofs in "thatched" effects, in which the shingles are bent over curved eaves. The answer is that when the purpose is frankly for decorative effect, and when everything else about the house is in character with the English cottage type, a thatched effect is legitimate from a purely decorative point of view, and with due recognition of the fact that actual thatch is a thing in itself, and that the shingle imitation is no more than a general approximation of the true thatch profile.

The popularity of hand-split shingles is simply a part of the general swing back to authenticity in building materials as they were used in older, sturdier days of building, before machine and mill finishes robbed many materials of their most interesting characteristics. The hand-split shingle is used more often for side-walls than for roofs, and is used for roofs where a rough and rugged effect is wanted. Cedar continues as the leading wood for shingles, and cypress is also quite widely used. So essen-

tially is this old form of roofing material a part of home building that competition of a variety of attractive fireproof roofings cannot diminish the popularity of wood shingles. For certain types of houses they remain the most appropriate of all roofing materials.

Among inexpensive roofings there are many shingles made on a fabric base, and these are widely used on an economy basis rather than on their comparative merits of appearance. From the architect's point of view, the fabric shingle roof tends to lack texture as a whole. It lies too flat. An essential of any roof should be an effective emphasis of its units, as brought out by the thick butts of shingles, slates or tiles. When a shingle is made synthetically, that is, compounded of asbestos and other materials, the architect, without being too exacting, demands that it be so designed that it will lie up in roofs that have not only color but texture.

This requirement has been admirably met by a number of composite shingles, in which color, texture and form have been combined to provide a roofing material virtually ideal. Lighter in weight than tile or slate, asbestos composition shingles do not require extra-heavy roof framing. . . . . The whole pageantry of autumn colors—reds, dull oranges, russet browns—is included in the color ranges, with old blues and purples to introduce here and there as interesting accents. Some ranges include pearl gray, red, buff and black.

Most of the asbestos shingles are of the same composition throughout, while asphalt shingles are made, in the lighter grades, on a tough fabric base; both types, in all their varieties, are so styled in attractive color ranges as to be definitely a contribution to the esthetic side of building. There are several makes of these shingles which have now been in service over periods of time long enough to prove their wearing qualities as well as their lasting beauty in blended harmonies of color.

Roofing tiles have at last come into their own and been warmly approved by the most exacting architects. For many years, this roofing material was technically in no need of criticism, while esthetically it made the unfortunate mistake of kilning every unit with an identical color and texture. The result was that a roof laid up in tile might, so far as appearances went, have been made of stamped metal and painted red or green. These were the two colors, and the green was of a harsh and violent hue. It was impossible to lay a roof with the charming accidents of color, not to speak of the age-old weathering of the tile roofs that have for ages captivated every visitor to European countries. . . . . Now the English type, exactly like the irregular, hand-made product of Elizabethan days,

is reproduced in this country, and tile-roofed houses in any type of English architecture can be made authentic. Even the centuries of weathering have been reproduced and so skilfully that it is very difficult to distinguish one of these new shingle-tile roofs from an old roof brought over with great trouble and expense from England.

It is the same with the Spanish or Mediterranean type of tile, sometimes called the Roman tile. The whole effect of a Mediterranean house, whether it derives from Spain or Italy, depends upon the subtle variations in the range of mellow colors found in the roof tiles. There has never been any real reason why roof tiles should not have been baked in variations of color—but it has only been recently that manufacturers have realized the architectural opportunity, as well as the necessity of doing so.

The roof of slate is one of the oldest and, from its nature, one of the most satisfying of all roofs. It is a natural product, formed by hand, and its beautiful range of color it owes also to nature. From the earliest times men have roofed their homes with slate, wherever it was available, and slate roofs laid hundreds of years ago are still in place.

For all that it has so long been, historically, a perfect roofing material, slate as we now see it used on country houses was neglected, or, differently stated, it was misused. During the 1880's builders had the idea that the thing to do with slate was to split it as thin as its structure would possibly allow, to cut its edges perfectly true and grade it for absolute uniformity of color. If there were dull reds, purples, greens or blues, these were set aside to use in absurd patterns for "fancy roofs." You have seen them on the grander houses of that period on roofs bristling with lightning rods and filigree iron cresting, the patterns generally based on monotonous hexagons and the rest of the roof about as interesting as oilcloth.

Slate as an effectively rugged material, dowered by nature with an incomparable range of beautiful color, came in with the new architectural integrity, when architects began to use wood, brick, stone and other things appropriately.

Slate is not an inexpensive roofing material, though no comparisons should be made without due consideration of its everlasting permanence. Generally it is used on houses of higher than average construction cost, and obviously on houses of brick, stone or half-timber. It is harmonious with stucco but a frame house must be extra-substantially built to take the weight.

Cost, after all, is relative and it would be a mistake to entertain any cost prejudice in regard to slate. Architects and builders have roughly

estimated that a slate roof figures roughly two per cent of the total construction cost of the house. Against this there are to be considered its absolute permanence and its protection against fire and weather and its essential character and beauty. Each slate quarried out of the rock is shaped by hand, no two exactly alike in color, and the color range is one more beautiful and harmonious than any artist could create.

The choice of any roofing material, like the other factors for construction by the prospective builder, will be predicated on various things, of which cost is only one. Esthetically (rather than practically) speaking, cost should come last. The ideal roof is the one that is permanent, protective, beautiful and architecturally in character with its house. The architect has ideals, but no illusions on the roofing question; the prospective builder may learn much by consulting with him, and may, if he wishes, make a personal examination of the various roofing materials now available. And they are better and better looking than ever before.

INSULATION[1]

Thermal insulation is concerned with the problem of reducing the transfer of heat from one region to another. The physical principles involved in the subject of insulation are thus identical with those involved in the subject of heat transfer. Heat is transferred by three general methods or modes, called, respectively, conduction, convection, and radiation, which may operate either separately or in combination, depending upon the particular conditions. In any case the flow of heat invariably takes place from regions of higher temperature to regions of lower temperature.

1. CONDUCTION

In solid materials heat is transferred by a process known as conduction, the exact nature of which is not completely understood. The amount of heat conducted from one region to another is proportional to the temperature difference between the two regions in question. The ability to conduct heat varies widely among different materials, metals being, in general, far better heat conductors than nonmetallic substances. It therefore follows that nonmetallic materials are, in general, better insulators than metals. Gases, with two exceptions, are the poorest conductors of heat, but, as will be discussed later, heat transfer through gases is usually complicated by other factors besides conduction.

[1] Adapted from *Thermal Insulation of Buildings* (Circular of the U.S. Bureau of Standards, No. 376, 1929), pp. 1–10.

The numerical measure of the ability of a substance to conduct heat is called its thermal conductivity, defined in customary units as the amount of heat in B.t.u. (British thermal units) which will flow in one hour through a uniform layer of material 1 square foot in area and 1 inch in thickness, when the temperature difference between the surfaces of the layer is maintained at 1° F. A B.t.u. is the amount of heat necessary to raise the temperature of 1 pound of water 1° F. The insulating value or thermal resistivity of a material is equal to the reciprocal (one divided by) of its conductivity.

Thermal conductivity is a property of the material itself, not depending upon the size and shape of a particular piece of the material in question, providing the latter is of uniform structure. It is therefore incorrect to speak of the conductivity of a wall or other structure but only of the conductivity of the material or materials of which the structure is composed.

When dealing with a given body, such as a building wall, its insulating value as a whole is measured inversely by a property known as conductance, defined as the amount of heat flowing through the wall per unit time and per unit area when the temperature difference between the surfaces of the wall is 1°. The insulating value or thermal resistance is equal to the reciprocal of the conductance. The conductance of a wall depends upon the conductivity, size, and arrangement of the materials of which the wall is composed. If it consists of a single uniform material, its conductance is numerically equal to the conductivity of the material divided by the thickness of the wall. If the wall is composed of parallel layers of different materials, its conductance can be easily calculated from the respective thicknesses of the layers and the conductivities of the materials composing them. The insulating value of the wall is equal to the sum of the respective insulating values of the different layers. If, on the other hand, the wall does not consist simply of parallel layers, the calculation of the insulating value from the conductivity and dimensions of the wall components is much more difficult, and will not be discussed here.

2. CONVECTION

The transfer of heat in a liquid or gas is usually complicated by other factors besides conduction. Conduction is always present, but the heat transfer is ordinarily greatly increased by fluid motion called convection, set up either automatically by reason of temperature differences or by means of mechanical stirring or blowing. The former is called natural or

free convection and the latter forced convection. The exchange of heat between the air in a room and the inside surface of the external wall is one of the simplest examples of natural convection. The phenomenon of convection is rather complicated and cannot be accurately expressed in terms of simple laws like those of conduction; but as an approximation, heat transfer by convection can be regarded as proportional to the temperature difference.

3. RADIATION

The transfer of heat from one solid body to another through the intervening air or other fluid medium is still further complicated by radiation, which results in a heat transfer practically independent of the presence of the air. The process is the same as the transfer of heat from the sun to the earth through the intervening space devoid of matter. Everybody is familiar with the radiation of heat from an open fire, but it is not so generally recognized that radiation plays a very important rôle in heat transfer at ordinary temperatures. In fact, about one-half of the heat transfer from a heated room to the inside surface of the exterior walls takes place by direct radiation from interior objects and partition walls. The other half is the result of convection in the air near the exterior walls.

Air Spaces as Thermal Insulators

Although air is a very poor conductor of heat, the insulating value of an ordinary air space is rather small, on account of the large transfer of heat by convection and radiation. Radiation is largely responsible for the ineffectiveness of air spaces bounded by ordinary building materials, such as are found in frame or other hollow walls. The low insulating value is often erroneously attributed to convection; but, as a matter of fact, from 50 to 80 per cent of the heat transfer across air spaces of ordinary sizes takes place by radiation. If the air spaces were bounded by bright metallic surfaces, the transfer of heat by radiation would be greatly diminished, since clean metallic surfaces are much poorer radiators than nonmetallic surfaces, such as brick, stone, glass, wood, plaster, paper, etc.

The terms conductance and resistance (insulating value), as already defined, can be applied to an air space as well as to a slab of solid material. On account of the large effects of radiation and convection, however, the insulating value of an air space is not proportional to its width (thickness), as would be the case with a slab of uniform solid material. Furthermore, the insulating value varies considerably with both mean temperature and temperature difference. For spaces more than about three-fourths inch

wide the insulating value is practically constant, independent of the width. Narrower spaces have less insulating value, and below about one-half inch the insulating value is approximately proportional to the width. Under average conditions the conductance of the vertical air spaces commonly found in building walls is about 1 B.t.u. per hour, per square foot, and per temperature difference of 1° F. It will be seen later that this figure corresponds to an insulating value approximately equivalent to a one-third inch thickness of average insulating material.

Insulating Materials

A thermal insulator is essentially a material having a large percentage of relatively small voids containing air. Little, if any, convection can take place within such a material, and the solid portions effectively screen off the radiation, so that the low conductivity of air is utilized to a much greater extent than in an air space. Since every known solid material has a greater thermal conductivity than air, it is evident that the conductivity of air fixes the lower limit of the conductivity of insulating materials containing air. By exhausting the air from an insulating material the conductivity can be materially reduced, and although this principle is made use of in certain types of thermos bottles and jars, it is impracticable on a large scale.

The application of the term thermal conductivity has thus far been restricted to uniform or homogeneous materials. Insulating materials are obviously not homogeneous in the microscopic sense, but in a practical sense they may be considered homogeneous, since their structure is fine-grained in comparison with the size of the specimens ordinarily dealt with. Bearing this in mind, we may use the terms thermal conductivity and insulating value in the same sense as they have been used in the case of homogeneous materials.

Investigation has shown that the differences in the respective thermal conductivities of the various light fibrous or cellular materials are not very great. The conductivities of most materials manufactured and sold primarily as insulators fall within the range 0.25 to 0.35 B.t.u. per hour, square foot, and temperature gradient of 1° F. per inch thickness. Of such insulators less than $1\frac{1}{2}$ inches of the poorest material is equivalent in insulating value to 1 inch of the best. The better insulators approach fairly closely to the ideal limit, since the thermal conductivity of air is only slightly less than 0.2 B.t.u.

Commerical insulating materials can be divided into two general

groups—(1) fibrous materials either in loose form or fabricated into soft flexible quilts confined between relatively thin layers of paper or textile and (2) more or less rigid boards in which the components are bonded together in some way. The differences in the respective insulating values of materials within each group are usually so small that the average purchaser can neglect them. In fact, the tabulation of these small differences often tends to obscure other far more important facts. In general, the lighter the material per unit total volume the better its insulating value per inch of thickness. Stiff fibrous insulating boards having considerable structural strength are somewhat poorer insulators than lighter and looser materials. Dense highly compressed wall boards made of wood or other organic fiber are not as good insulators as less compressed boards of the same general character. Heavy wall boards containing plaster in one form or another are relatively poor insulators, although they are very useful building materials, and, like building paper, may be valuable in reducing infiltration of air through an otherwise porous wall.

Insulation of Buildings

From the point of view of insulation only, the most important question is the thickness of insulating material to be applied, rather than what material to select, provided the choice is restricted to the class of cellular or fibrous materials. No known material in a very thin layer can be expected to provide an appreciable amount of insulation. On the other hand, a relatively thick layer may not be economical, since relatively little additional gain is made over some layer of intermediate thickness. The selection of a material for a particular purpose must be governed largely by the requirements of that purpose in a way of structural strength, cost, fire hazard, etc. The real cost of an insulating material is obviously not the cost per square foot of commerical thickness but rather the cost per unit insulating value of the commerical thickness.

If a layer of insulating material is added to a wall, the insulating value of the wall will be increased by an amount equal to the insulating value of the layer of material added. The thicker the layer the greater will be the insulating value of the resulting wall. The percentage increase in the insulating value of the wall, however, will depend upon the original insulating value of the wall without insulation. The percentage increase in the insulating value of an actual wall containing windows will also obviously depend upon the amount of glass surface and the air leakage around windows and doors, since these factors are unaffected by the addition of insulating material.

A great many types of walls and roofs are to be found in present-day dwelling-house construction. The insulating value of one type or individual may be considerably different from that of another, but in an actual building heat losses through and around windows and doors tend to level out the effect of these differences in the properties of the walls themselves to such an extent that there are no wide variations in the amounts of fuel required to heat houses of various types of the same size in the same locality, unless air leakage around windows and doors or through very poorly constructed walls is excessive.

An estimate of the probable savings in fuel resulting from insulating or weather stripping an ordinary dwelling house is given in Table XII. The first part of the table gives the fuel saving expressed in per cent of fuel which would have been required for a similar house without insulation or weather stripping. In the second part of the table the savings are expressed in per cent of fuel required for a house without insulation but with weather stripped windows. The calculations were based on data on heat transfer in building construction taken from the "Guide," published by the American Society of Heating and Ventilating Engineers. An average insulating material ($K=0.31$) is assumed, but no commercial fibrous or cellular insulating material departs far enough from this average value to make a significant difference in the approximate figures in Table XII. In taking into account the effect of windows and doors, it is assumed that the aggregate area of such openings is equal to one-fifth of the total side-wall surface, and that the heat loss through such openings is that corresponding to a 5-mile wind striking perpendicular to the wall. This corresponds roughly to average conditions over a large part of the country. Whenever insulation is involved, it is assumed that the insulation is applied to both walls and roof, and that the insulation is not substituted for some other member which is present in the uninsulated construction.

The ranges in values correspond to the extremes in wall constructions usually encountered in average dwelling houses. As a general rule, ordinary walls of solid masonry are somewhat less effective in retarding heat loss than well-constructed frame or hollow tile walls. A somewhat greater percentage saving in fuel is therefore obtained by insulating a solid masonry wall than by applying the same insulation to a frame or hollow tile construction. Any house representing a considerable initial investment, particularly one with solid masonry walls, should be insulated, since the cost of insulation is a small proportion of the total, and the resulting additional comfort and fuel saving is considerable.

It should be borne in mind that any calculations dependent on experimental values of air leakage around windows are subject to great uncertainty on account of the variability of the factors involved. A well-built house without weather stripping may when new show less heat loss by air leakage than has been assumed in calculating the fuel savings given in

TABLE XII

APPROXIMATE FUEL SAVINGS IN DWELLING HOUSES

(Expressed in percentage of fuel which would have been required for similar house without insulation or weather stripping)

	Saving Per Cent
No insulation, weather stripped	15 to 20
Same, with double (storm) windows	25 to 30
½-inch insulation, not weather stripped	20 to 30
½-inch insulation, weather stripped	About 40
½-inch insulation, with double windows	About 50
1-inch insulation, not weather stripped	30 to 40
1-inch insulation, weather stripped	About 50
1-inch insulation, with double windows	About 60

(Expressed in percentage of fuel which would have been required for similar house without insulation, but with weather stripping)

	Saving Per Cent
With double windows, no insulation	10 to 15
½-inch insulation only	25 to 35
½-inch insulation, with double windows	40 to 45
1-inch insulation only	35 to 45
1-inch insulation with double windows	50 to 55

Table XII. The gain resulting from weather stripping such a house would be correspondingly less. It should also be realized that infiltration of air is not necessarily disadvantageous, since a certain amount of ventilation is necessary. In the ordinary dwelling house air leakage is relied upon to furnish part of the ventilation, and it is unwise to attempt to prevent such leakage altogether. It does not appear, however, that ordinary weather stripping will reduce the air leakage to an excessively low value.

The calculations involving insulation are much more definite and certain than those involving air leakage. The application of insulation re-

sults in a certain absolute saving which is independent of heat loss through or around windows and doors. The per cent saving of fuel, however, is still dependent upon the heat loss through the uninsulated openings.

In summer the effect of insulation is beneficial, but too much should not be expected in this respect. Increasing the total insulating value of a wall or roof will always tend to keep the building cooler during the hot part of the day, but many other factors in addition to the insulating value enter into the question in a rather complicated way. In general, thick masonry walls having large heat-storing capacities are better than relatively thin insulated walls. The insulation of roofs is probably much more effective than the insulation of walls, since the former have much greater exposure to the sun.

[NOTE.—Some of the most common raw materials from which insulation board is made are cornstalks, wheat straw, sugar cane, flax straw, wood-pulp tailings, wood waste, spent licorice root.]

INTERIOR WOODWORK[1]

BY FRANK A. CONNOLLY

Interior woodwork should be the result of accurate millwork, painstaking carpentry and careful selection of wood. There is a comfort, a richness to the home warmly ornamented with wood that no tapestry, no canvass or other ornamentation can impart. And such decoration, at once the most reasonable and the most effective way of giving true character to the home, can be accomplished by the exercise of good taste and the insistence upon careful workmanship.

Interior woodwork covers a gamut of items. There is the cabinet work, the paneling, moldings, door and window frames, built-in arrangements and stair parts. Hardware, decidedly not wood, becomes in a sense interior woodwork the moment it is installed in or applied to such woodwork; for besides its utility purposes it serves as further ornamentation of the wood, and as such its installation should be carefully watched. The same is true in a sense of glazing, whether it be doors, windows or fan lights.

There formerly has been considerable waste in the specification of millwork. This has been caused by designers being only superficially familiar with millworking practices, and added to by the fact that heretofore there has been inadequate standardization within the millwork industry. This latter fault has been greatly relieved in all items except those few minor

[1] In *American Building Association News*, April, 1930.

ornamental wood items where individuality of production or specification design is the main feature. Designers, also, have come recently to realize that by improving specifications to conform more closely to mill facilities and practices much waste and expense can be eliminated. There is scarcely an architect who cannot find it possible to readily discuss proposed designs with woodworking mills or mill representatives. Further, with the existing wide range of stock material from which to choose, it is entirely possible, by selecting from among stock patterns for various items to develop a complete woodwork arrangement that will be individual and distinctive.

In the selection of interior trim the few following rules, which are taken from "Wood Construction," the handbook published by the National Committee on Wood Utilization of the U.S. Department of Commerce, are well to bear in mind:

1. It should be free from resin, sap stain and pitch pockets.

2. It should resist warping and be of good working qualities.

3. Standard interior trim should have no defects, unless in long lengths where the defects may be eliminated by cutting, as it is applied to the job.

4. All interior trim should be run from carefully kiln-dried stock, to insure against open joints, warping and twisting.

5. All wide-trim members, such as base and casing, should be backed out, which is an advantage in fitting and, in addition, is somewhat of a guarantee against warping.

6. All flat surfaces of trim should be fully sanded. This operation can be done most effectively at the mill, eliminating the necessity of sanding on the job. Raised grain on the face of sanded trim is a common fault, but not a defect. It is the result of incorrect kiln-drying or incorrect handling after manufacture and usually arises from the character of the storage space where held ready for delivery. By all means, storage of trim on the job where it will be exposed to the weather should be avoided.

A variety of woods may be had for interior ornamentation. These include soft pine, yellow pine, oak, Douglas fir, maple, chestnut, gum, birch, walnut, poplar, pecky or plain cypress, knotty pine, redwood and many others. However, all of these woods are produced in the best ultimate effects where the technique employed at the mill, including a knowledge of proper speeds for tools in milling each wood, is good or is known to meet a recognized standard.

Much of the interior woodwork is built up, principal members usually being stiles, rails and panels, such as we find in doors, windows, cabinets,

etc. This necessitates the use of much glue and considerable progress has been made in recent years in the improvement of waterproof glues. However, there are methods of fitting panels between rails and stiles that overcome many glue weaknesses and weak points in wood that would take volumes to discuss, and here we find another good reason for the architect either selecting stock designs or consulting with those familiar with woodworking technique before attempting an individual and novel designing scheme. While discussing stiles, it is well to remember that stile ends exposed, as we necessarily find them at the tops and bottoms of doors, are a source of possible trouble. The grain ends form a ready receptacle for moisture and a good application of white lead and oil is a very practical means of eliminating the penetration of moisture.

As is known, stairs should not be built into the house. They should be designed, assembled at the mill, and then installed. Risers and treads must be fitted just so to the stringers and must then be wedged and glued into place. The balustrade must be properly fitted in so that the dovetails turned on their ends will carry real support for the balusters. The building of a stairway is not simple carpentry; it is the creation of a product that will maintain appearance and resist wear and disalignments of its member parts in what is probably to be the most traveled passage in the home. It requires sound engineering and true mechanic's skill.

Quality woodwork can generally be recognized by its clean-cut workmanship. Sharp contours of moldings and tight, trim fitting of cabinets, doors, windows and other items are noticeable. And when such material has been ordered and received care should be taken to keep it in the best of condition. Wood intended for natural finish should be free from all defects, and should be characterized by the absence of any bruises, sander marks or raised grain. A slight blue sap stain may be permitted when it is intended to paint the surface.

Upon receipt of material on a job it should be given a protective paint coating on all exposed surfaces. Great care has been taken by the mill to get it just so; the builder should keep it so. It should be stored where it is not likely to be bruised or otherwise worn. Careful checking of widths and heights against openings should be made and where necessary to trim such trimming should be balanced between sides or surfaces and not done, as in the case of doors, all at the hinge or all at the lock stile side.

Though labor charges for installation bear a large part of the expense of interior woodwork, there is no extravagance in hiring a competent, careful carpenter or cabinet worker and letting him take his time in put-

ting in the woodwork. Such a man, though he may seem to be slow, will make more real progress than the man who slaps material into place. This has been one of the great handicaps of speculative building. An effort is made to rush the job. Such houses are usually sold on the time payment plan. Woodwork is carelessly handled, allowed to become weather exposed, poorly selected and cut-out in installation, poorly matched and fitted; the hardware is notched into place; the doors are planed on one side or hung in openings into which they do not fit snugly and true and, all in all, a poor, hurry-up job is done. What the buyer originally looks upon as an investment soon becomes an upkeep extravagance. It loses value. The purchaser loses interest. The underwriting loses security. Dissatisfaction, lowered sale value, lessened demand ensue.

There is no stronger visual sales appeal than to be able to demonstrate to the prospective purchaser, even in an old house, a well-done job of interior woodwork. It is not only beautifying, but its workmanship is convincing. In the eye of the prospect "if there is such selection of material, such refined designing, such careful workmanship in these details, the house must be a substantial and worthwhile structure." And there is strong sales appeal in the substantial structure. Every house should be "built for the ages," and interior woodwork is one of the tell-tale evidences of whether such intention was in the mind of the builder. If it was, there will always be a market for the house. If not, it will be just another house to glut the market.

THE USE OF WOOD AS FINISH-FLOORING MATERIALS[1]

By ROBERT T. JONES
Technical Adviser, Architects' Small House Service Bureau, Inc.

So far as houses are concerned the commonest floor is of wood. Let us take that one first. We can have wooden floors of hard wood—oak, maple, birch, and beech. Or we can have soft wood—pine, hemlock, fir, or redwood, and some others. I have not included teak or walnut, or mahogany, or a dozen other imported woods that make most magnificent floors, for the simple reason that they cost more than the small home builder can afford, beautiful as they are.

[1] Adapted from "Variety in Finish Flooring," *Small Home*, March, 1930. For information on subflooring see the article "The Backbone of the Floor," *ibid.*, February, 1930, also written by Mr. Jones.

Now, if you were to approach this matter very carefully you would obtain technical documents that are prepared by wood flooring manufacturers in which they state the qualities possessed by the various grades of floors they manufacture. They are called grading rules. You would find that every kind of ordinary wood flooring is manufactured in a number of different grades. These grades are determined principally by the appearance of the wood, by the number and kind of defects in it, and by the average length of strips. The first grade has a surface practically free of defects with an average length of approximately 5′. The second grade admits slight imperfections like tiny worm holes or small tight knots. The average length of these strips is 4′. The third grade will be of such a nature that it will make a sound floor without cutting, and the average length of these pieces is 3′. Any of these grades may be obtained either in flat sawed stock or quarter sawed.

One makes a choice on the basis of the appearance of the wood, the way it is to be stained, and the kind of effect desired, and adjusts the grade to his purse. For the inexpensive residences the middle grades are recommended and preferably the thickness known as $\frac{13}{16}''$.

Rather generally speaking there are two classes of pine, southern and northern. Southern pine has a quality of grain that is distinctly marked especially after it is stained. Hemlock is like this also. Northern pine does not ordinarily have such a strong grain figure. So we find these kinds with the elaborate graining used for finished floors and the others employed principally for subfloors or floors over which linoleum or flexible tiles are to be laid. Fir and redwood are used extensively where they will be exposed to weather.

This much must be noted—if the finished floors are of soft wood they must be quarter sawn. These woods when flat sawed turn up flakes of wood growth that would splinter readily and wear badly if used as flooring. On the other hand, soft woods of edge grain stock or quarter sawed wear very well indeed. The hard woods are hard enough so that quarter sawing is not necessary.

Again, any of these wooden floors may be obtained in various widths. Ordinarily the common floor that most of us can afford is made of boards that finish 2″ across the face, but much wider boards can be used. Some of these in very expensive woods are made of veneered stock. Some are of solid wood impregnated with waterproofing so that they will not change in form or volume with exposure to the air. We call these floors of wider boards "plank" floors. They are extremely handsome, but they are also

somewhat costly. When they are used in random widths, fastened down with screws to simulate the appearance of pegs, and keyed together with dovetailed sections that fit into adjoining pieces of the boarding, they are handsome indeed, giving us some of the qualities possessed by old English floors.

Then there are block floors made of oak. Here thin strips of ordinary flooring are jointed together very closely into small squares and fastened on the back with metal bonds. These are laid in an asphalt mastic. The resulting appearance is checkered. The old name for such flooring laid in short lengths of individual pieces is parquetry. Thus there is a rather wide range of widths and shapes of wooden flooring from which the home builder may make his selection.

Maple, birch, and beech are particularly fine when treated with one of the new stain and lacquer finishes that have been perfected by coöperation between the maple flooring manufacturers and a paint maker. Previously these woods were used principally where it was desired to get a very light colored floor. The stains then available did not seem to penetrate the wood satisfactorily, so dense and hard it was. The new stains are available in practically every color under the sun, and the wood takes them well. The delicate graining is brought out distinctly. These stains may be used with other woods. And thus the home builder's choice of wood for his flooring is decidedly widened. One has to see these floors to appreciate their beauty. They represent a distinct contribution to beautiful home building.

OTHER FLOORING MATERIALS[1]

By ALEXANDER BOND

The foundation of a room, the most used part of the building, the basis for all decorative treatment—that is the floor.

In days gone by, floors were made almost entirely of wood, ends being pegged with wooden pegs into the joists. Boards were wide and thick. And now, by that queer quirk of style, the same type of flooring is one of the latest to make its appearance, though the pegs are ornamental rather than utilitarian.

The era of muddy painted floors and woodwork seems to be past. More and more floors are being treated so that they may reflect life and beauty.

The efforts of master designers are being bent to make floors of all

[1] "Floors Keep Step with Progress," *American Builder and Building Age* (formerly *Building Age*), April, 1929.

materials so beautiful and durable that the competition of other manufacturers and materials may be met and conquered.

As a consequence, particularly within the past few years, great advances have been made in flooring.

Borders of all sorts are now sold ready assembled, providing not only an artistic effect but a lowering of cost in laying that is not the least satisfactory part of their use.

Newer materials have invaded the flooring market, many of them basing much of their appeal on the richness of their coloring and the various pleasing patterns in which they can be bought.

To-day linoleum, once considered a kitchen material, has found itself, through improved methods of manufacture and better design, invited to the front of the house. Now it is used in entrance halls of the most expensive houses, ... the breakfast nook and nursery particularly find it a suitable material.

Rubber tiles have also come into widespread use, particularly in kitchens. They also are being made in bright colors that harmonize with the finest type of decoration.

Cement floors, far from presenting the cold gray surface of a few years back, now revel in a riot of color. They can now be finished up to look like gayly-colored tile, marked off into gay patterns of fascinating types that suit them for all parts of the house.

Tile, too, has won a place as a flooring material that was hardly thought of when its use was confined to bathrooms. Like the other flooring materials, it is being used all over the house with effects undreamed of a generation ago.

Slate, for centuries a roofing material, has found itself being employed first for entrance walks, then for outside porches, later for enclosed porches, and finally finds itself on the inside of the house, where it fits into many a decorative scheme as if it had always been so used in this country.

Various kinds of composition flooring have come into wide use since the beginning of the present century, ...

Other flooring materials are being used, too numerous to mention in a short article such as this. They have in their entirety, however, opened up a choice of flooring materials that is without rival in the history of building. Not only the new, but the very oldest materials, have set a style pace and a quality of product that were unthought of even as late as the beginning of this century.

Color, natural finishes, the realization of even the beauty of knotty and stained cheaper grades of lumber, have all brought to the modern home a floor beauty that answers every taste and suits every purse.

"What do you sell when you sell a building?" an enthusiastic flooring dealer asked one day. "Floors, of course. When you sell a building you sell it by the square foot of floor. Walls are built to surround the floor, a roof to protect it, a foundation to support it!"

Discounting somewhat this enthusiasm, the fact remains that floors are most subject to wear of any part of a structure, and for this reason should receive most careful and thoughtful attention from the builder. The past fifty years have been years of progress and of remarkable development in the field.

WALL PLASTER AND PAINT

Excellent information on kinds of plastering, furring, function of lath and kinds of lath, plastering materials, mixing and application, decorative features of plaster, causes of cracks, softness and efflorescence, and other topics may be obtained from *Wall Plaster: Its Ingredients, Preparation, and Properties* (Circ. 151, U.S. Department of Commerce, Bureau of Standards), to be obtained from the Government Printing Office.

Most helpful information on paint materials, ready-mixed paints, varnishes, paint mixed on the job, preparation of wood, brick, concrete, plaster, and metal surfaces for painting, and other important subjects may be obtained from the bulletin *Painting on the Farm* (U.S. Department of Agriculture, Farmers' Bull. 1452 [1925]), obtained from the Government Printing Office. Additional help may be obtained from *Paint and Varnish* (Circ. 69, U.S. Department of Commerce, Bureau of Standards), also obtained from the Government Printing Office.

NEW BUILDING MATERIALS

During the past ten or fifteen years many new materials and better uses of old ones have been brought to the attention of the public. Through research and experimentation hundreds of new materials have been put on the markets—many of which have added to both the comfort and the attractiveness of homes. The prospective home builder often is at a loss to know which materials will be the most economical over a period of years and which will be the best suited to his needs. Ernest P. Goodrich, of the Research Institute for Economic Housing, discusses in the following paragraphs from "The House of the Future," *American Builder and Building Age* (formerly *Building Age*), September, 1930, the opportunities provided by the use of some of the new building materials:

New materials, easily erected, open opportunities which are just becoming known. Manufacturers have begun to realize the importance of research and development, and within a few years they have produced a wide variety of materials which are certain to play a prominent part in the house of the future.

Mentioning just a few of these will give some hint of what we are to expect. Some of them have not been completely worked out as yet, but definite steps are being taken to have them available for marketing as soon as possible.

1. Cement blocks of normal concrete.
2. Light weight blocks produced from aerated concrete and light weight aggregates—"puffed rice" made of clay is one such material.
3. Large factory built sections, such as concrete lumber, T-stone units, large gypsum units.
4. Steel frames with cork slab panels.
5. Compressed straw, reeds, rushes, and vegetable fibers made into large units to be stuccoed on one side and plastered on the other.
6. Metal walls, floors, roofs, and ceilings (properly insulated, of course) made of rustless steel, or various varieties of copper, bronze and aluminum.
7. Glass floors and walls, either transparent or opaque, of the non-shatterable variety.
8. Glazed, aerated, large area, reinforced clay slabs.
9. Windows and window spandrel units with heating facilities. House partitions similar to metal office partitions now in use.
10. Large units of brick, in any size or shape.

As to the design of the future house, it seems likely that sufficient variations in mass, pattern, color, texture, and shade will be obtainable from these materials to permit just as much architectural beauty as is possible in the present type house. The commercial buildings of the country are certainly creditable from an architectural standpoint, and many of the features which I have mentioned are being included in them.

Roger B. Whitman has discussed in his article "Ten Years of New Ideas"[1] the most important of the new materials and changes which the last decade has brought about. He states:

Changes that affect the structural parts of a house are in the introduction of new materials as well as in improvements in the old. Lumber is one example. This was formerly produced with no exactness in size or in uniform standards of quality; sizes are now precise, qualities are in established grades, seasoning is definite, and each piece is marked for these characteristics and for identification. While an architect will have his opinion, it will be for the owner and his family to decide whether the floors will have the resilience that comes with wood construction throughout, or are to be of less resilient steel and concrete, using

[1] *House Beautiful*, September, 1930. (Reprinted by permission from the *House Beautiful* magazine.)

steel beams of a lightness appropriate to residence construction and covered with a reinforced concrete slab, the finish flooring being the same in both cases.

There must also be a decision as to whether the casements are to be of wood or metal, and if the latter, whether of steel or of bronze. Even the window glass will be up for discussion, for in addition to the glass that has been standard for a generation or two, plate glass must be thought of for its brilliancy and lack of distortion, along with the special types of glass that permit the passage of ultra-violet rays. . . . .

Wood lath is no longer the only base for plaster; but if in place of it the owner decides to use metal lath, he must be specific as to the kind and the weight, for some is plain, some is stiffened with ribs that act as furring strips, and some is combined with a heavy paper backing. There is also the possibility of plastering on stiff sheets of fiberboard or on corkboard; materials that in addition to being substitutes for lath serve the purpose of insulation.

In Heat-Proofing.—Here is opened a possibility that ten years ago was non-existent: The heat-proofing of a house for economy of fuel in the winter and the keeping out of summer heat, but more vitally for the elimination of drafts, and, as a result, the maintaining of even temperatures throughout the house during the heating season. Heat-proofing calls for storm sash, metal weatherstripping on all outside openings, and the insulation of roof and walls—that is, the incorporation within these of a layer of material that will check the passage of heat and of heated air. Storm sash is a known quantity, while with efficient weather-stripping the choice will be between several non-corrosive metals. With insulation the choice is wide in material, in form, and in position: Animal, vegetable, or mineral; in flexible blankets, semi-flexible and stiff sheets, or loose; to be beneath the outer finish, within the stud and rafter spaces, and partly or completely filling them, or on the inside walls. Selection of material and of method will depend on the construction of the house, and will be affected by the protection that is desired, by price, and by other factors. That his interests may be best served, an owner can hardly reach a decision without a fair knowledge of the entire situation.

The cellar of a house of ten and more years ago was strictly for practical needs; but the modern owner can make as good use of it as of any other part of the house. Through advanced methods of water-proofing a cellar can be tight and dry even with a swamp or running stream beneath, while condensation from the contact of damp air with chilled foundation walls can be prevented by linings of insulating materials. . . . .

The only floorings that were formerly to be considered were of wood, and in small variety. Wood is still in greatest use, with an increase in the kinds that are available as well as in their treatment and finish. One advance is a process of impregnation through which wood, and especially oak, is rendered nearly immune to atmospheric changes; oak in wide planks, so greatly desired for certain

period designs, but unsatisfactory because of shrinkage, can now be laid with good assurance of permanence. By another process, blocks for patterned floors are laid in a cement that remains plastic, and through which a floor gains a pleasant resilience. With improvements in grading, in seasoning, and in finish, wood flooring has been generally bettered in appearance as well as in resistance to wear. In addition there are new floorings, linoleum, tile, and plastic materials, which are possible candidates for almost any room in the house.

The introduction of quick-drying lacquer a few years ago has resulted in the speeding up of the drying and hardening of paints, enamels, and varnishes, the benefit to the owner being a saving of time that permits redecoration in hours rather than days. The length of life of paint, especially for exterior work, has also been extended through the use of a metallic first coat that protects against deterioration from light.

While the selection of materials and the making of specifications call for far more effort on the part of the owner than formerly, he is immeasurably the gainer, and finds his compensation in a degree of comfort, convenience, and service never before possible.

2. Good Construction Practices

SOME OF THE ESSENTIALS FOR GOOD CONSTRUCTION[1]

By JAMES S. TAYLOR
Chief of the Division of Building and Housing,
U.S. Department of Commerce

Since the amount that a family can afford to pay for a house is limited, every detail of the house deserves consideration with respect to the return in service or satisfaction from the expenditure involved.

Stability in the foundation and in the structure is a first requisite in every new house, whatever its size or equipment, provided it is not strictly a temporary affair. Cracks in the woodwork and plaster, doors that stick and jam, and openings that let in rain and snow result inevitably if the foundations settle or if the walls or framework become distorted. The foundation wall itself should be at least eight inches thick if of solid concrete. If of other materials, it may need to be thicker. It should extend in depth below the frost line and have adequate footings whose width will depend upon the bearing value of the local soil. If piers or posts are used instead of foundation walls, corresponding precautions should be taken—and no wooden foundation posts should be used without preservative treatment to ward off decay and attacks by insects.

[1] Adapted from "Some Problems of the Small Home," *Journal of Home Economics*, May, 1930.

The walls and framework of the house obviously should be substantial, with all the important parts well tied together. Yet, after severe windstorms, we learn of roofs that are blown off, because they merely rested on the top of brick walls, without being anchored by ties to the masonry; frame houses that get out of plumb because they did not have proper diagonal bracing; and porches and ells that are wrenched loose because they were not tied to the main structure. In regions subject to high winds, frame houses without plaster to add weight and rigidity are in an especially dangerous position, unless they are well anchored to the foundations. The too common sagging roof line is generally a sign of the spreading of side walls caused by the thrust of the rafters, a condition which might have been avoided by using proper ties. Mistakes in design of interior framework, resulting in unequal shrinkage, often result in distortion of the whole frame and cracking of the plaster.

Diagonal sheathing is recommended as preferable to horizontal, except for stucco houses, where it has been found that less cracking of stucco occurs with horizontal sheathing and adequate corner bracing. Eight-inch brick walls should have a row of headers at least every sixth course.[1]

Adequate protection from wind, rain, and snow is essential. Nothing adds so much to the expense of keeping up a house or makes it run down so fast as chronic leakage, and for this reason intersecting surfaces of the roof, wall, window openings, and other danger points particularly should be water-tight. Adequate protection against fire is important. In many houses, there is a free passage for air from the cellar to the attic between the studs in the outside walls. This means that a fire starting in the basement or on the first floor is given every opportunity to spread to the whole house. It also gives cold air from the attic free play to chill the basement and the side walls of rooms, and allows rats and mice to move about as they please. The remedy is to insert masonry or some other incombustible material, or 2×4 lumber, in these wall spaces at the floor and the top ceiling levels. Chimneys, fireplaces, stoves, furnaces, and stovepipes are frequently the sources of fires. Omission of flue lining and placing of combustible materials against chimneys are faults to be guarded against.[2]

[1] "Recommended Minimum Requirements for Small Dwelling Construction," by the Building Code Committee of the Department of Commerce, discusses such structural details as are mentioned here.

[2] Farmers' Bulletin 1230, of the Department of Agriculture, entitled "Chimneys and Fireplaces," contains excellent material on such points and also tells how fireplaces may be equipped so as to serve as warm-air heaters. Pamphlets of the Department of Agriculture and the Bureau of Standards contain directions for protection against lightning.

In connection with interior wall finish and heat insulation, the home builder has a wide range of choices. In a frame house that is to be sheathed, good waterproof building paper in the wall is probably the least costly step toward assuring a warm house at reasonable expense. Weatherstripping around doors and windows comes next. Insulating materials over the top floor ceiling joists, or under the roof, and in the walls, and storm windows may all be used to advantage.[1] It must be remembered that it is relatively hard to add heat insulating materials in the walls after the house is built, whereas weatherstripping, or heat insulation on the attic floor or under the roof can be added at any time. The interior walls may be finished with wood or metal lath and plaster, with plaster board, a composition material that takes the place of lath and of the rough coat of plaster; or with a wall board which can be used without further finish, or decorated as desired; or interior walls may be ceiled with matched lumber. Any of these can be surfaced with any of a wide variety of materials.

PRINCIPLES OF GOOD CONSTRUCTION PRACTICE[2]

By ARTHUR HOLDEN AND ASSOCIATES, Architects

INTRODUCTION BY R. W. SEXTON

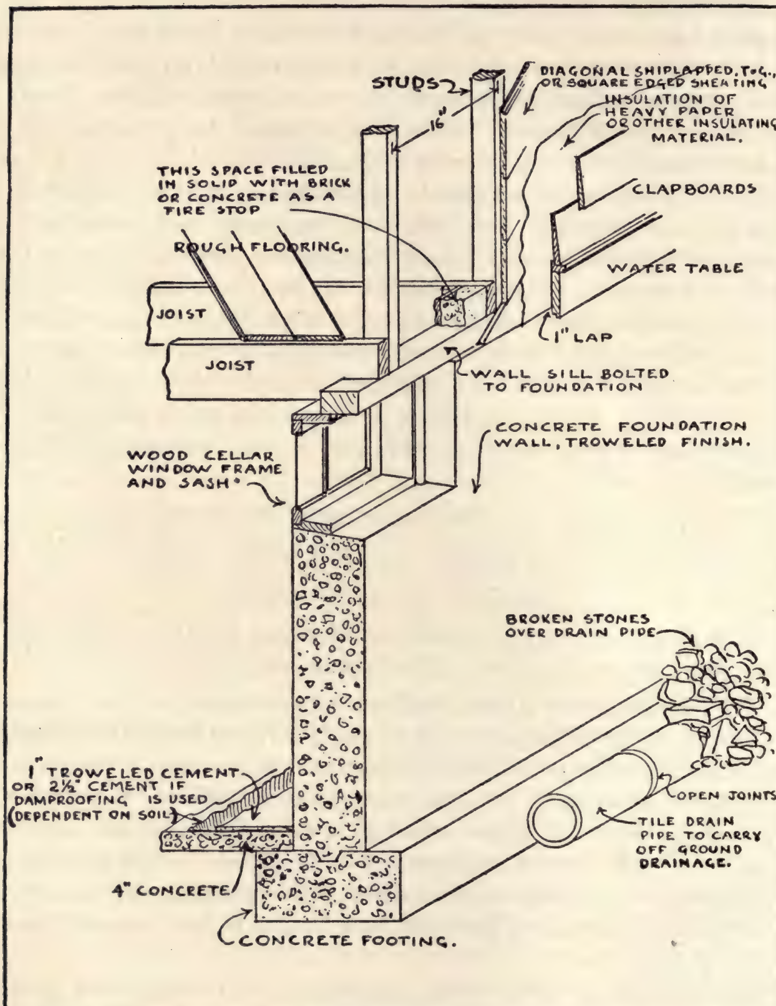
[The nineteen drawings, showing construction practice, which follow, have been prepared by Arthur Holden and Associates.]

The following series of drawings have been prepared solely for the purpose of acquainting the public with some of the things that it should know about home building. The details shown are not working drawings, but illustrative drawings of standard construction practices. The man who expects to have a good house should understand the component parts of that house, and when he does understand the reason for doing things in the correct way, he will not be satisfied with something that is inferior and will himself use intelligent discretion instead of just accepting what comes to him.

Better homes are going to be possible to the extent that the public realizes its own responsibilities. After all it is the owner that dictates what is done, and lack of understanding on the part of the public makes it possible for those who build homes to produce inferior houses, boxes, and cells to live in.

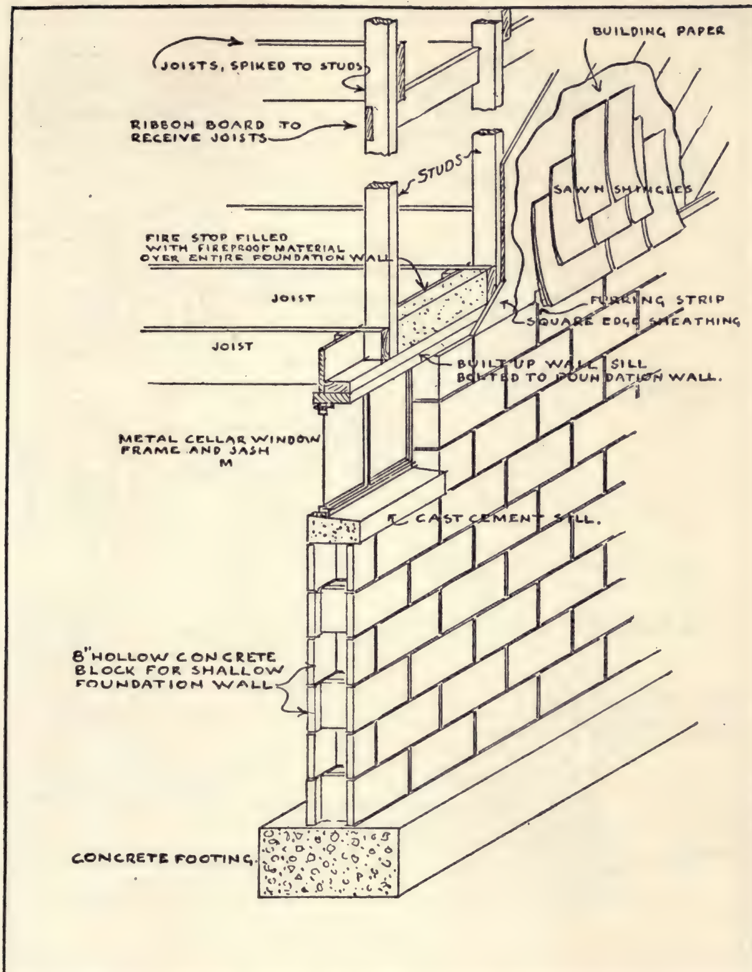
[1] See pp. 230–37.

[2] Adapted from *Pocket Guide to Good Construction.* New York: Own Your Home Exposition, Inc., 1927.



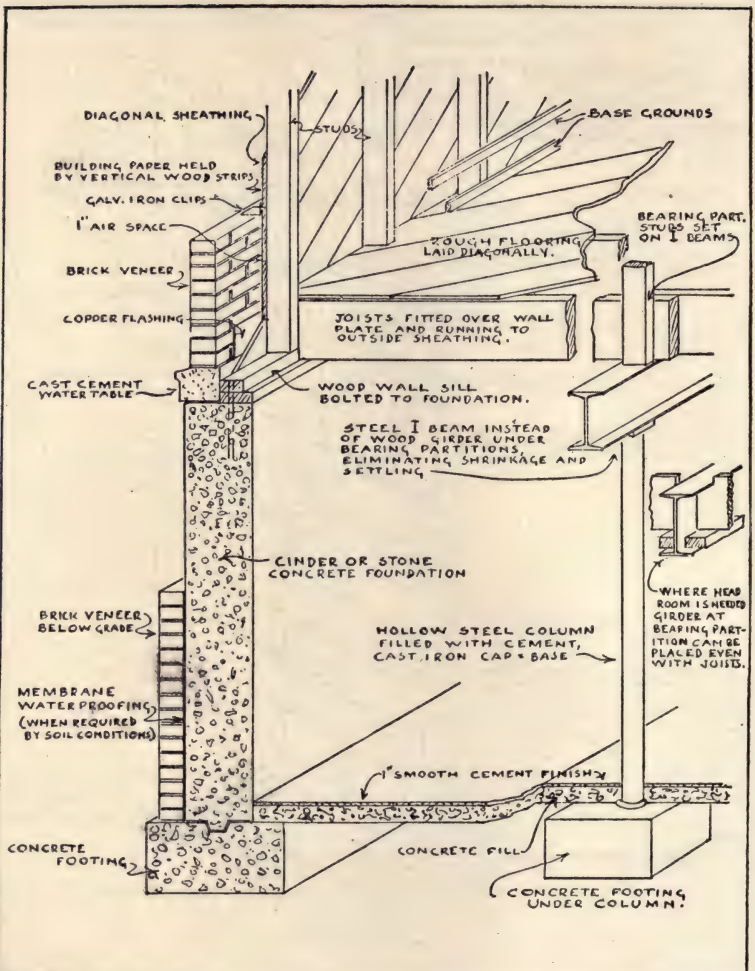
-CONCRETE FOUNDATION and CLAPBOARDS-

Fig. 26.—One of the chief reasons why many cheaply built homes deteriorate rapidly is that they do not have proper foundation. Footings should be carried to a firm bearing soil below frost, or to rock.



-CONCRETE BLOCK FOUNDATION-

FIG. 27.—Where easily procured, the use of concrete building blocks for foundations will be a saving. Studs run through two stories with the second floor carried on a ribbon (Balloon frame) is also an economy though not allowed in all localities.



-BRICK VENEER CONSTRUCTION-

FIG. 28.—Where brick veneer construction is used, it is important to provide air space between sheathing and brick, also to insulate against air leakage due to shrinking of the wood construction at all windows and doors. Brick veneer on the outside of waterproofing on foundations is a wise protection.

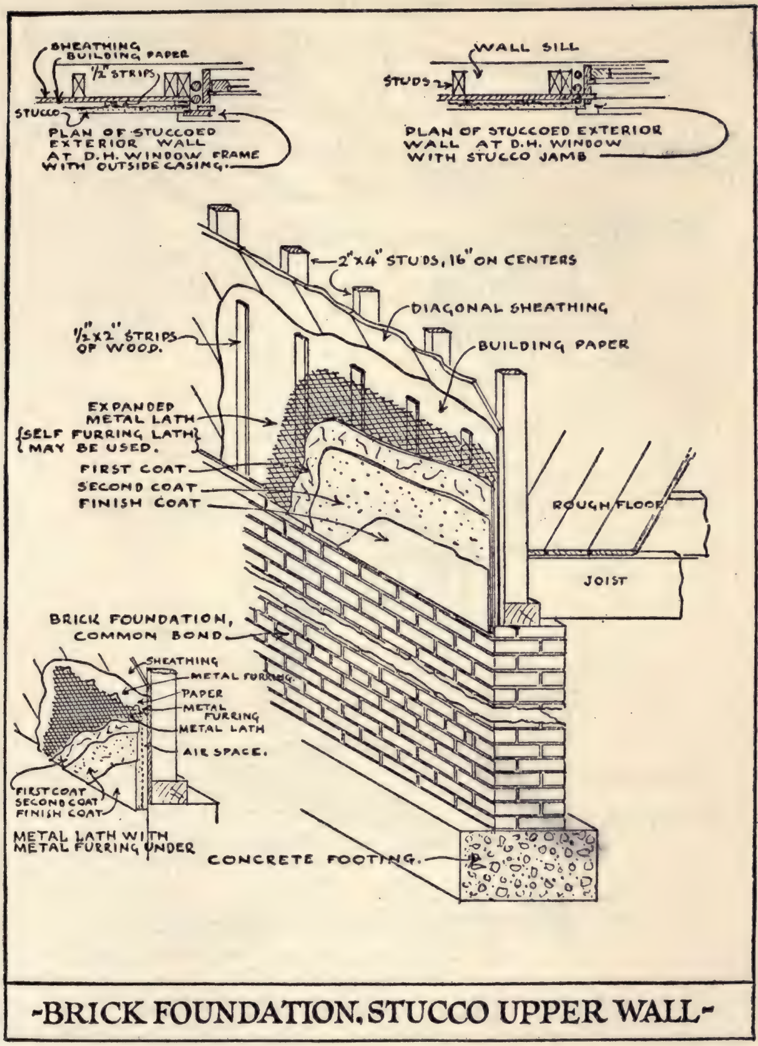
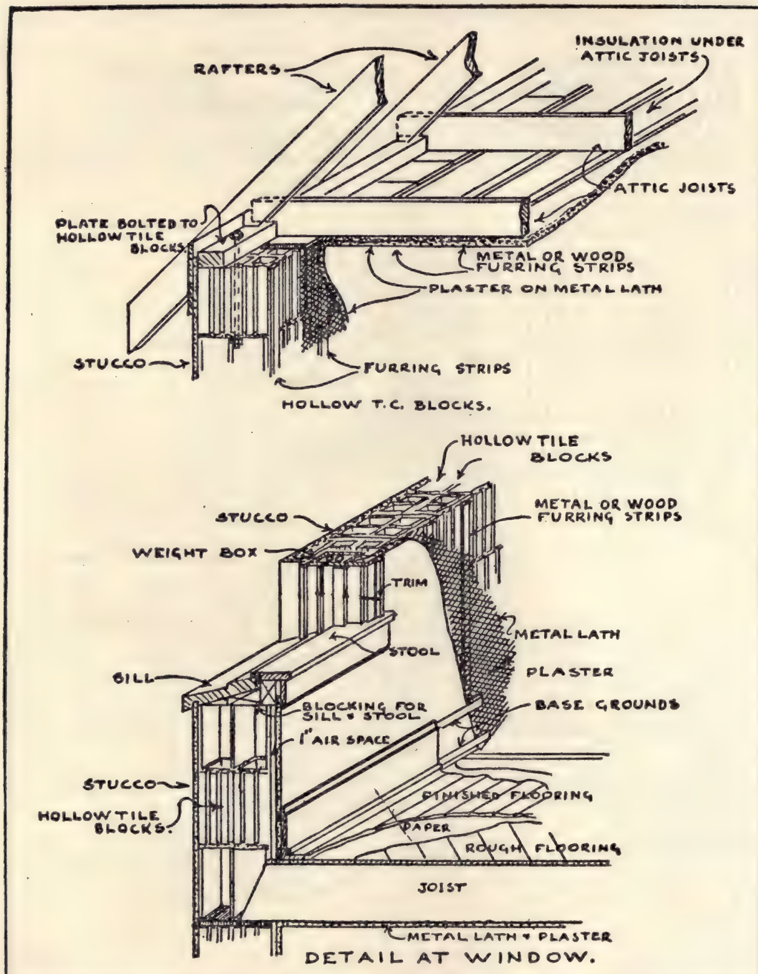


FIG. 29.—Dependent upon local conditions, brick is also a good foundation material. All joints should be thoroughly filled with mortar. Stucco on the exterior wall must be very carefully applied. Its permanence will depend upon the skill of the individual mechanic who does the work. Self-furring lath eliminates furring strips.



-HOLLOW TILE CONSTRUCTION-

Fig. 30.—Hollow tile walls make a fine base for exterior stucco; they should nevertheless, be furred on the inside before plaster is applied. Tile may also be laid with the webs horizontal. Care should be taken to see that the roof plate is securely anchored by bolts.

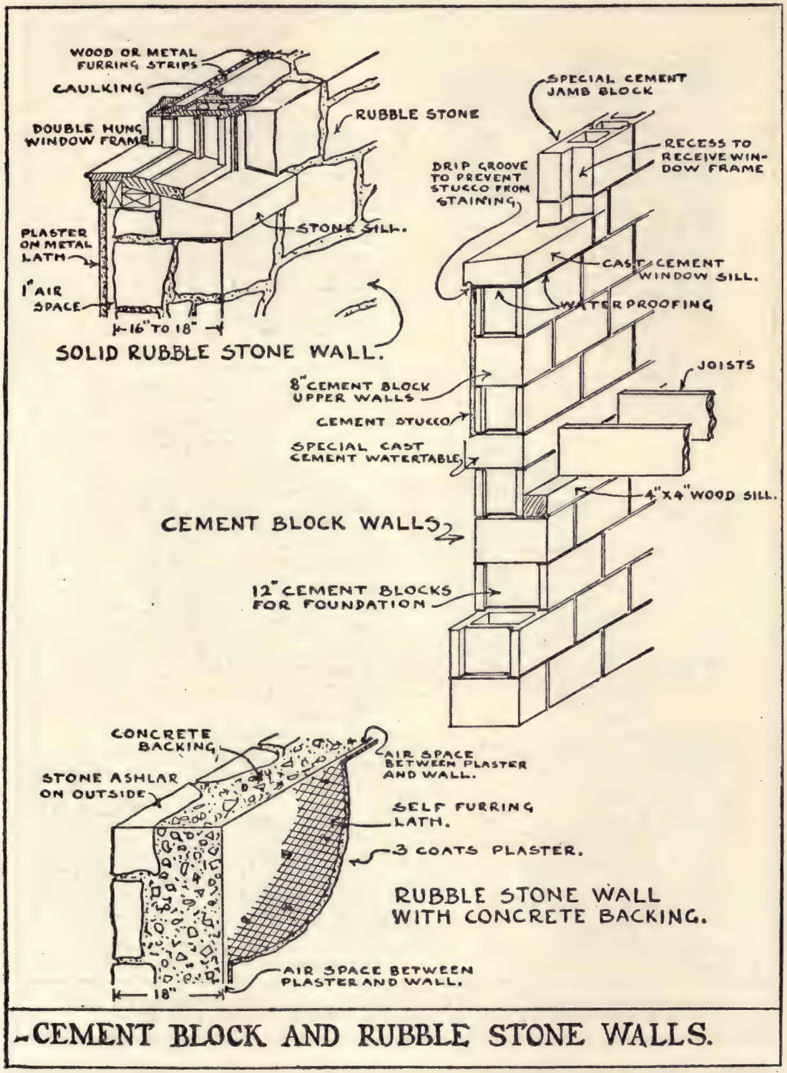
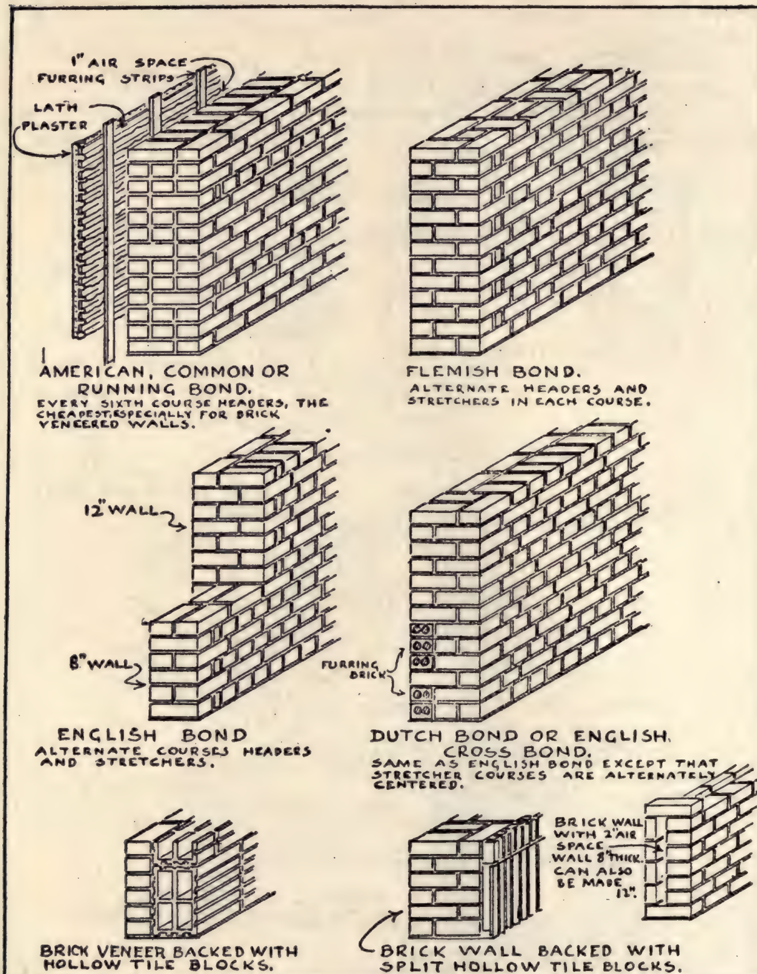


FIG. 31.—Economy in the use of stone depends upon whether it is plentiful in the locality. Furring provides an air space for protection against dampness. Cement blocks with special facings may be used without stucco. Avoid imitations of rough stone faces or raised panels.



-BRICK WALL BONDS and FURRING-

Fig. 32.—Brick walls depend for their attractiveness upon the bond or pattern in which the brick is laid and also upon the method of finishing the mortar joints. All brick walls should be furred before applying plaster.

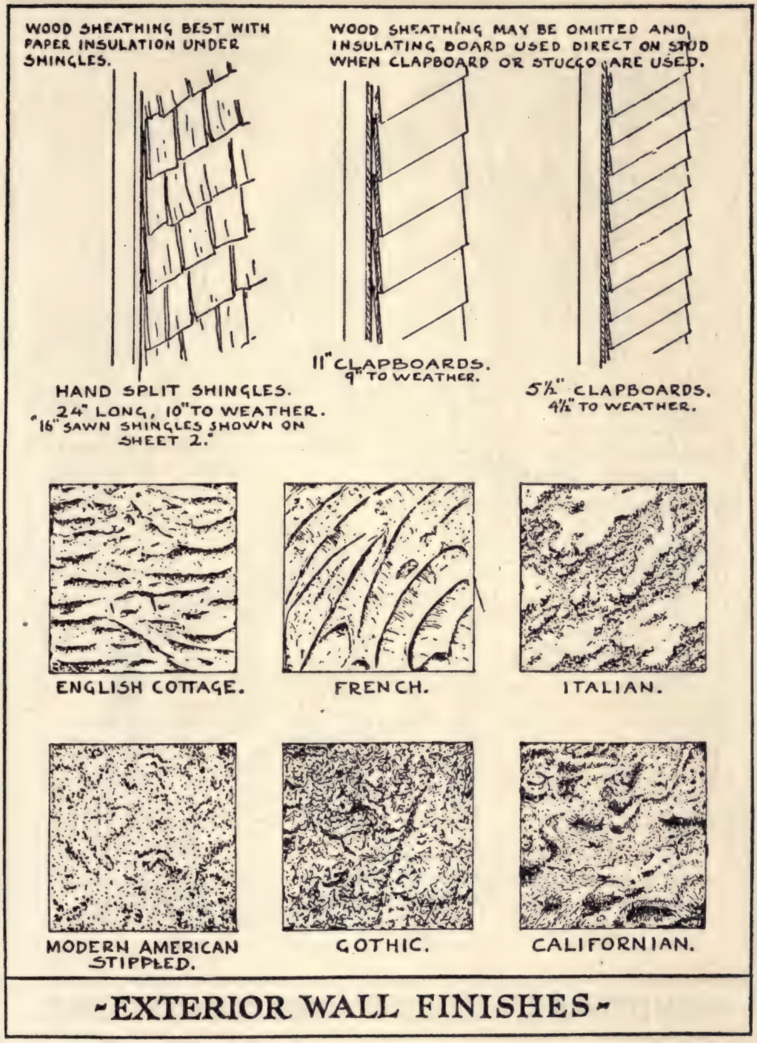
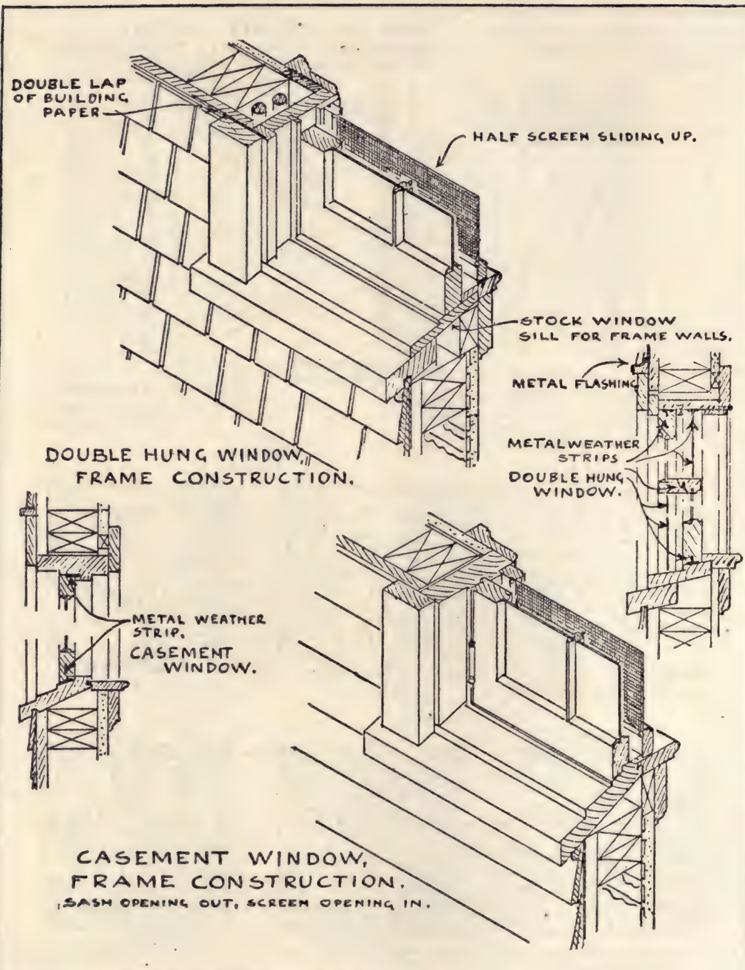
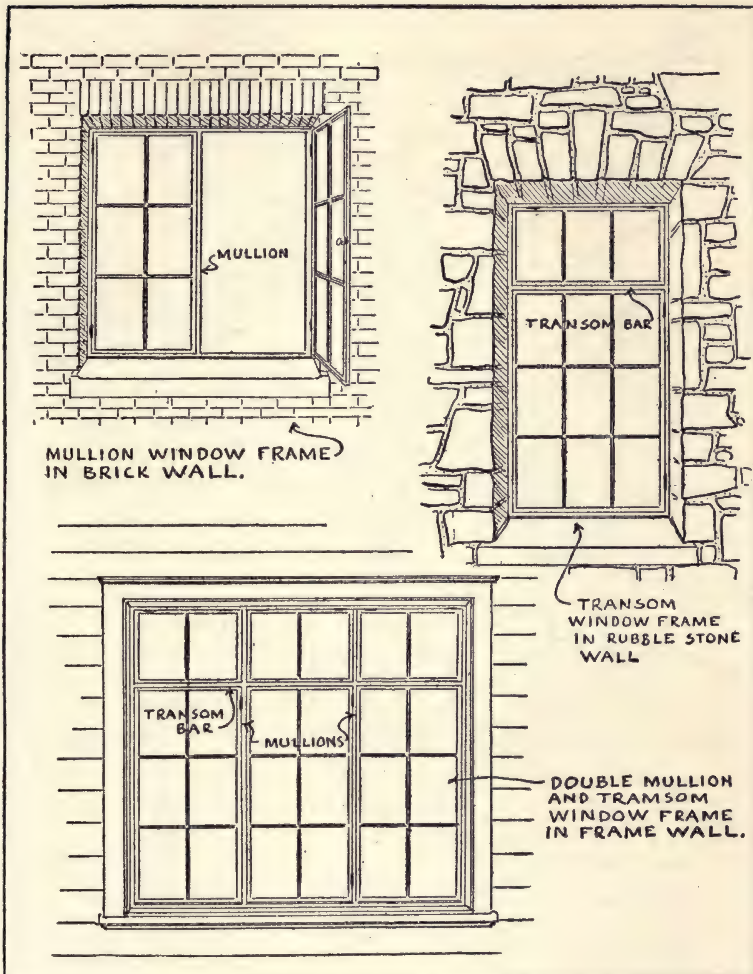


FIG. 33.—Much of the beauty of the finished wall depends upon its texture and color. Care must be taken, especially with stucco, not to carry either texture or color to extremes.



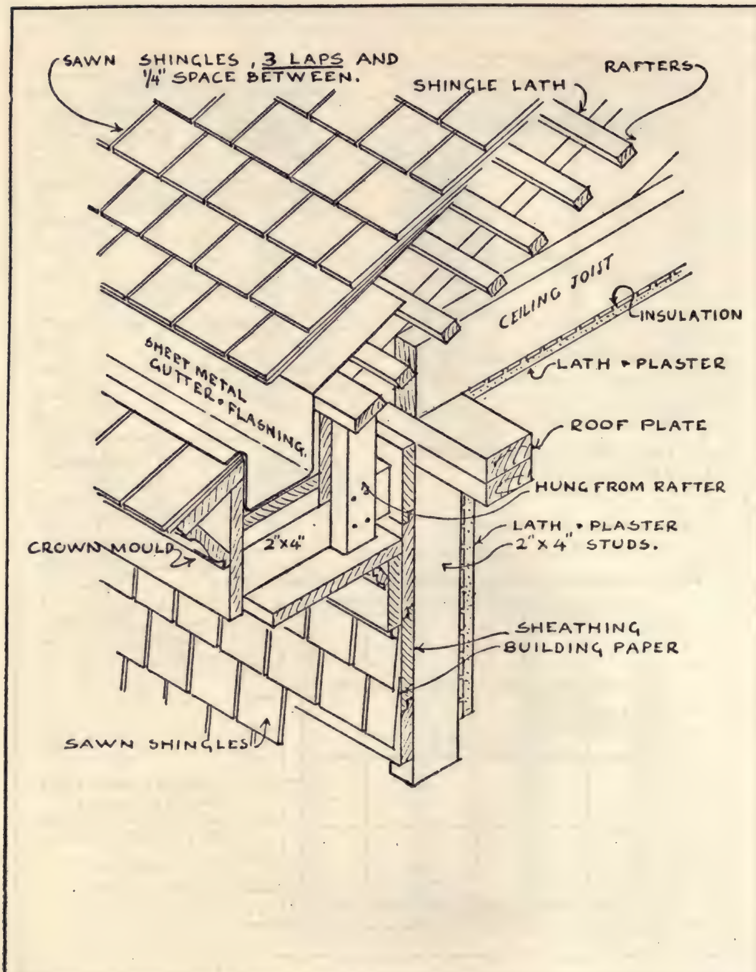
-WINDOWS IN FRAME CONSTRUCTION-

FIG. 34.—Window frames and sash are made at the mill. They must be properly designed and well put together or else they may leak even though protected by weather stripping. Use boiled linseed oil on channels in which sash runs.



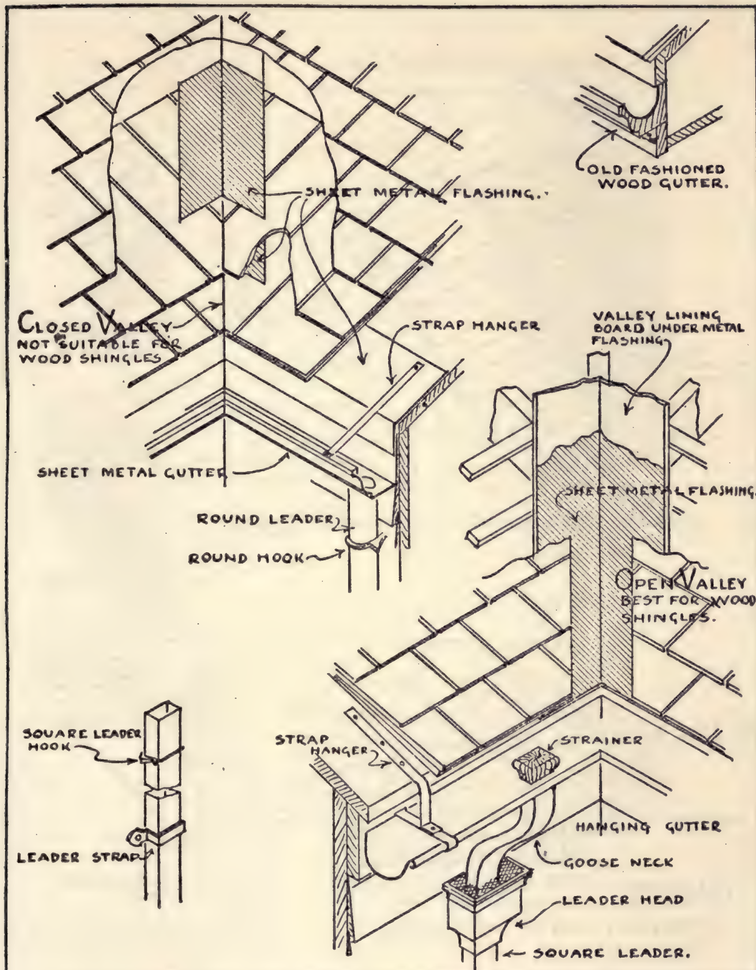
-METAL FRAMES and SASH-

FIG. 35.—Metal-frame casements may be built into either masonry or frame walls; they must be kept carefully painted. Sash may be glazed with window glass A or B grade single or double thickness; or plate glass in $\frac{1}{8}$ in., $\frac{3}{16}$ in., or $\frac{1}{4}$ in. thickness.



-FRAME CORNICE CONSTRUCTION-

FIG. 36.—There are many different types of cornice construction. Box gutters must be carefully flashed. Shingles may be used either on laths or, in dry climates, on sheathing (roofers) with building paper beneath the shingles.



- GUTTERS, LEADERS and VALLEYS -

Fig. 37.—The more durable the material used for gutters and flashings the longer the life of the roof and the fewer the repairs. Nine out of ten roof leaks are due to defective flashings.

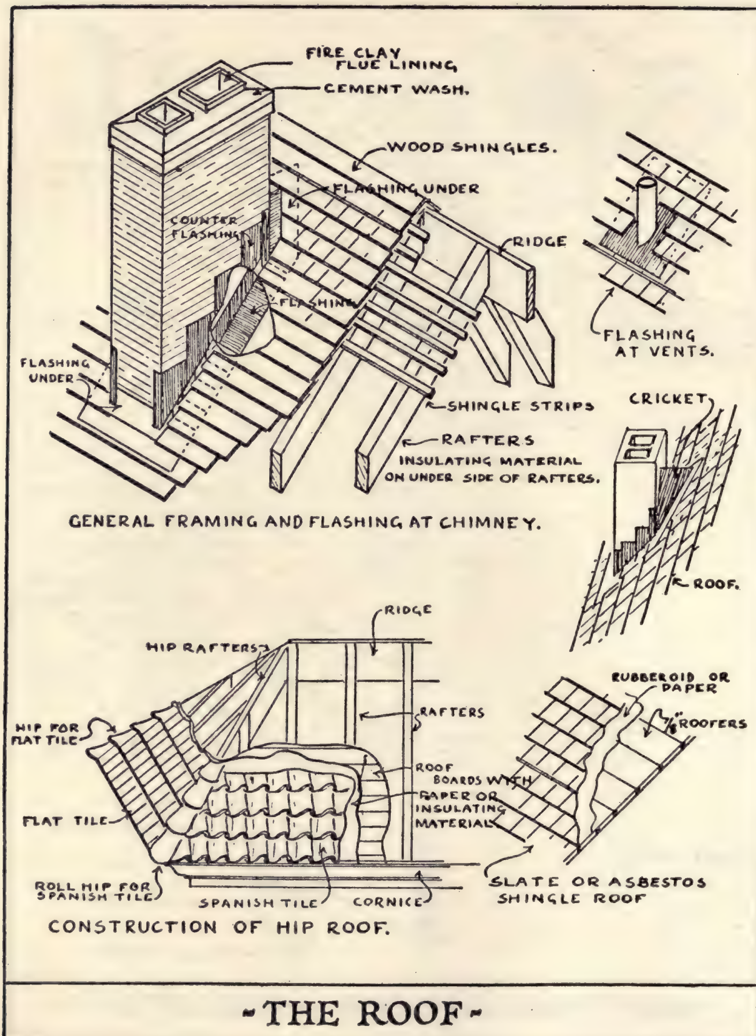


FIG. 38.—The roof, if faulty, is the place where the rain comes in and the heat goes out. All angles and points where pipes or chimneys pass through must be carefully flashed. Insulation under the attic floor or roof rafters is well worth while.

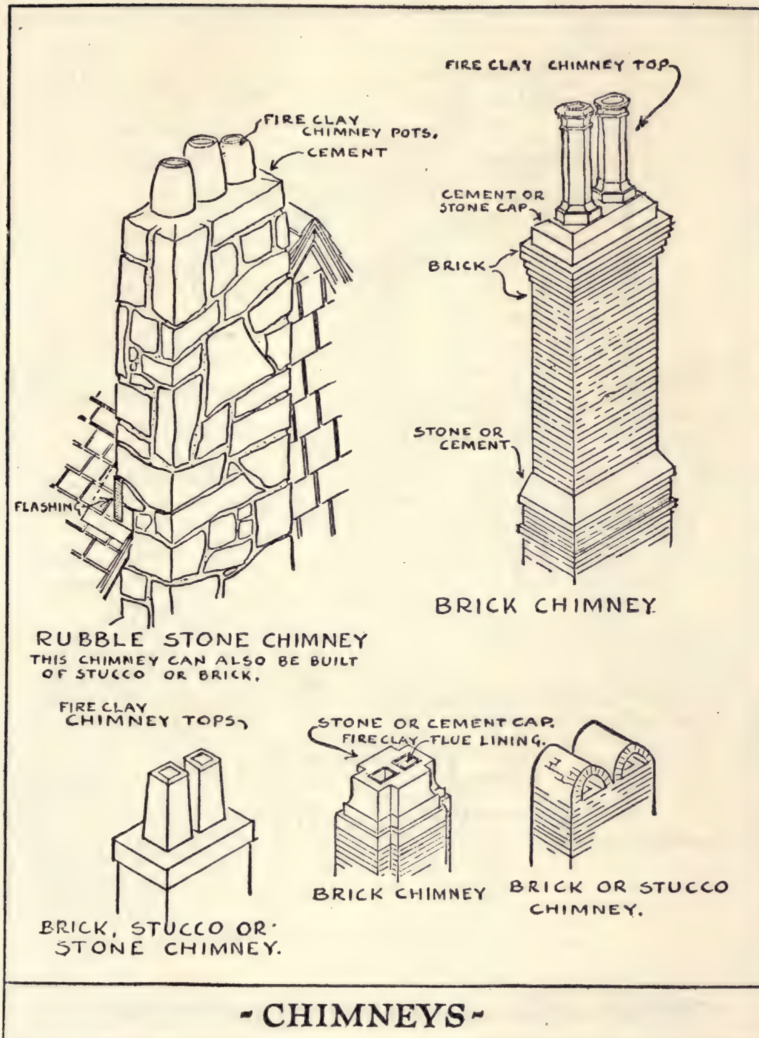
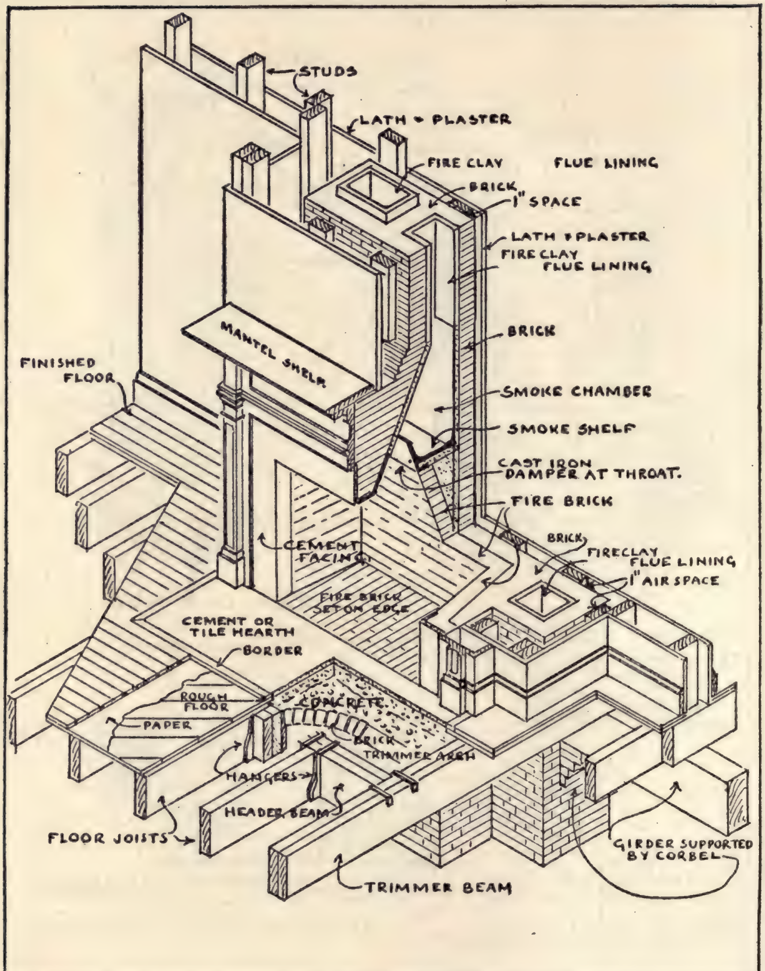


FIG. 39.—Chimneys may add character to a house. If badly designed they may spoil not only the appearance of the house but the usefulness of the open fireplace and lower the efficiency of the heating apparatus. Fire-clay linings are indispensable.



-FIREPLACE and CHIMNEY DETAILS-

Fig. 40.—The size of the fireplace opening depends upon the size of the individual flue which serves the fireplace. Where damper and smoke chamber are wrongly placed there is likely to be trouble with the drafts.

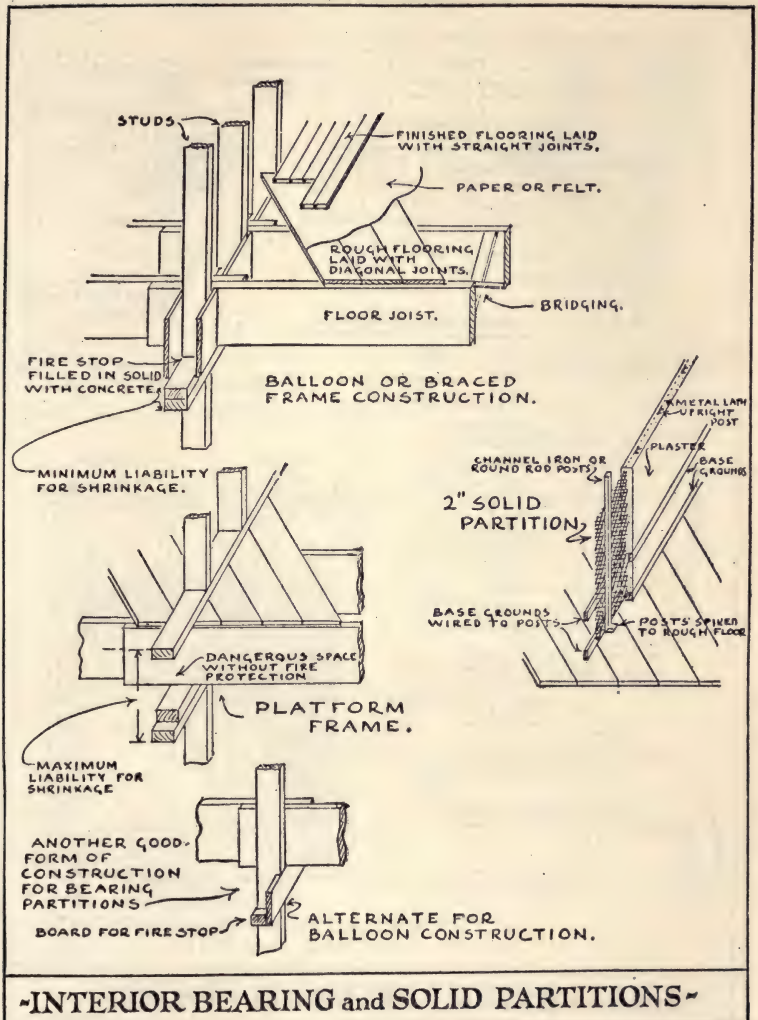
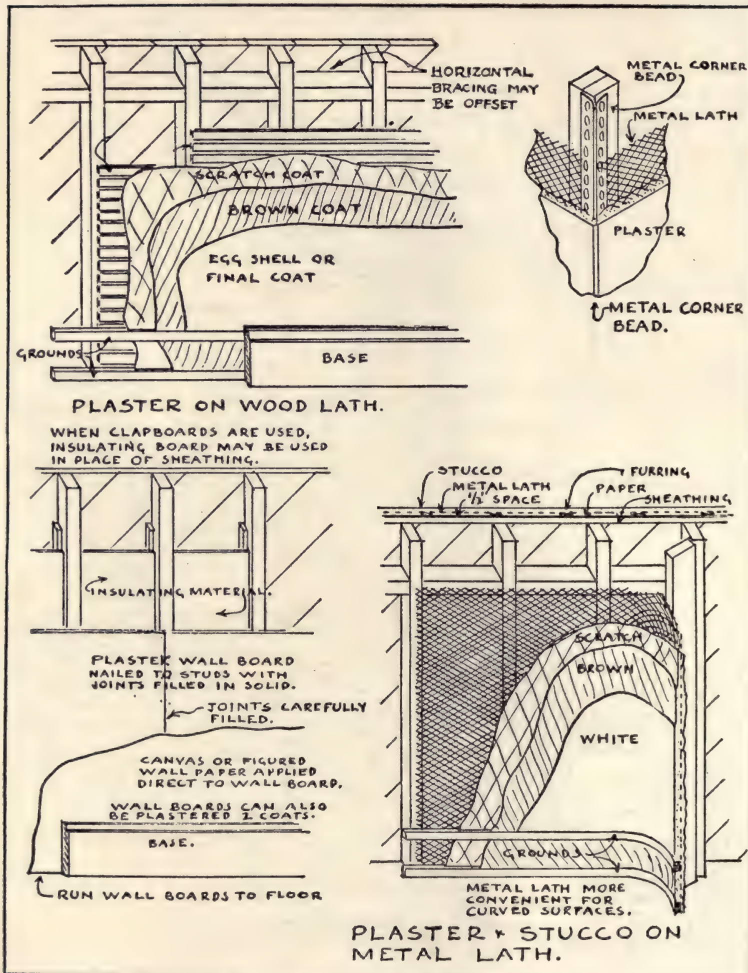


FIG. 41.—Care must be taken to prevent uneven shrinkages in frame houses by correctly arranged interior bearing partitions and the use of well-seasoned lumber.



-PLASTERING, INTERIOR WALLS-

FIG. 42.—Plastering is a craft requiring skilled working of the material. Time must be allowed for the plaster to dry out before applying trim or paint. Strips of metal lath applied to interior corners where wood lath is used will prevent cracks.

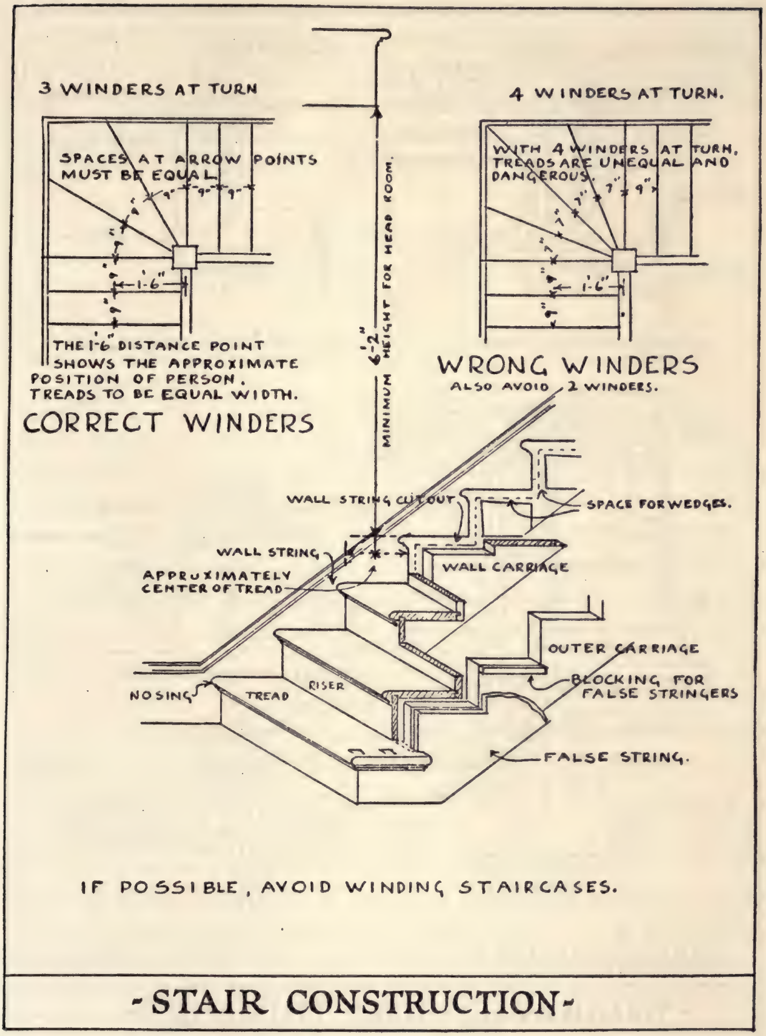
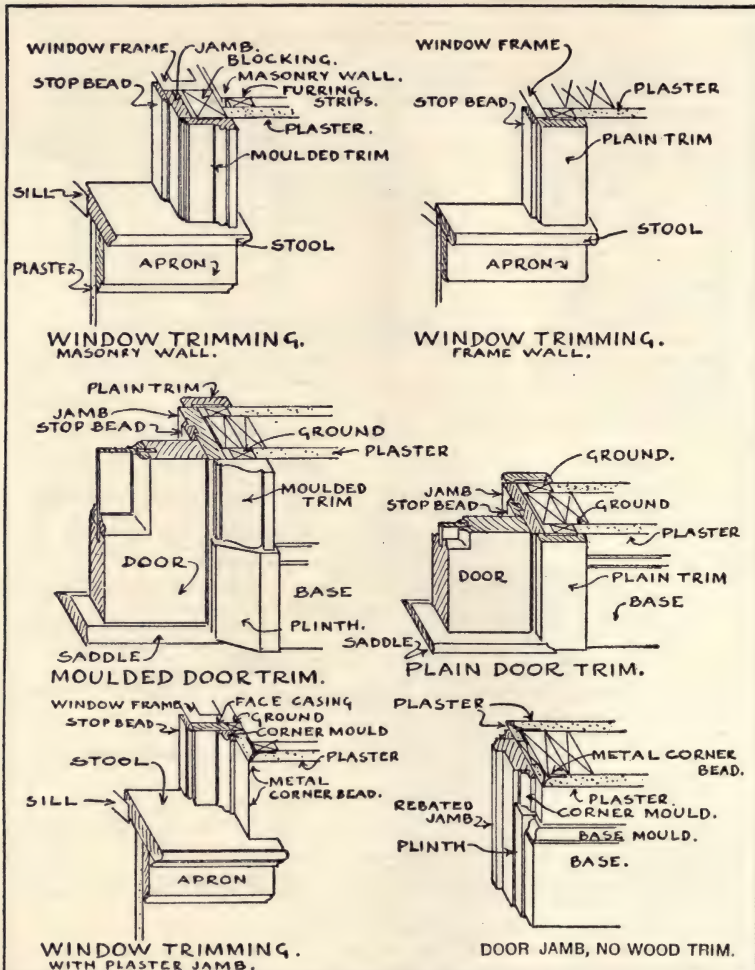


FIG. 43.—Well-constructed stairs are built up and fitted together. The treads must be of hardwood. Many building codes prohibit the use of winders.



- WINDOW and DOOR TRIMMING -

FIG. 44.—The beauty of the shadows cast by the moldings is responsible for the "character" which well-designed trim gives to a house. In the best work backs of all trim should be painted.

The desire to understand the construction of the home by the public is already responsible for a great improvement and it is our prophecy that this type of educational work will go further and further until public interest for sound and practical building has been fully awakened and the esthetic taste in relation to the knowledge of beauty and harmony in the home has reached a higher standard.

3. Jerry Building

WHAT MAKES A CHEAP HOUSE?[1]

By ROBERT T. JONES
Technical Director, Architects' Small House Service Bureau, Inc.

Everyone knows the difference between inexpensiveness that is arrived at by careful selection of sound materials yet without extravagance, and cheapness by which low costs are materialized through the use of inferior materials and workmanship. What I propose to show is the kind of a house one gets by this latter process. Even when two houses, one built well and one built poorly, are viewed side by side when they are new, fresh with paint, there is little to distinguish them superficially, though research brings out many details of inferiority in the cheap house. Time brings them all out.

The best way to materialize a cheap house is to employ a poor contractor. Here is one of the processes. Let us suppose the prospective home builder gets four contractors to bid on plans and specifications he has secured from some source or other. Let us suppose furthermore that three of the contractors are high grade builders who know their business and have established reputations for high grade construction. We will say that the fourth contractor is from the group that is pretty much unknown, perhaps one who has built quite recently a number of houses in the neighborhood at surprisingly low cost. The bids come in and in the course of time are opened, when it is found that the bids of the three superior contractors run very closely together and the fourth is off by itself. I have seen such circumstances as this, where there would not be more than \$200 or \$300 separating the responsible builders, and the other fellow would be \$1,000 below the lowest of these three.

[1] Adapted from "What Makes a Cheap House?" *Small Home*, July, 1930.

What does it mean? Does it mean that the high bids indicate that the profits of the contractors who submitted them will be $1,000 greater than the contractor who submitted the very low bid? Or do these high bids indicate that these bidders are less efficient in business management, less capable of getting the most for the construction money spent? Or is this due to the devastating fact that the $1,000 difference is to be taken out of the qualities of workmanship and materials indicated in the plans and specifications? If this last proposition is true, and it is true in a great many cases, the home builder who chooses that low-priced contractor does not get what he expects to get, often does not even get full value for his money. These houses built at these cut-throat prices are rarely worth what they cost. It will be manifest that if the plans and specifications are drawn so as to eliminate guess work, so that the contractors are all bidding on the same thing, then the figure $1,000 below the others means just so much essential quality taken out of durability, out of low cost of upkeep, out of real, lasting value.

And that brings us to the real point of the story. Here are some of the things that will not be supplied at the cheap price. And here also are some of the things that happen to that flimsy construction.

First.—The building may not have a good foundation. The sand or gravel used in mixing the concrete may not be clean, not enough cement will have been used, too much water may be employed in the mix, the footings, designed by guess and not by science, thin, not spread far enough, not adjusted to changing weights in the walls. Separate footings may not be prepared for the basement posts or columns that support the superstructure. Concrete bases raised above the level of the basement floor may not be devised for the setting of wooden posts. The wall may not be made water tight. Footing drains may either not be installed or not pitched properly. The backfill may not be made of well graded material beginning with coarse stuff to insure wal drainage. The mortar between the wall units may be thin, left unpointed on the outside where it must be pointed.

Then what happens? The walls will crack from uneven settlements, spring floods will come through the wa ls, the base of wooden posts not set above the floor level will rot, plaster will crack, floors will sag.

Second.—The superstructure walls may not be good walls. If these walls are of wood frame construction the braces and bridging that science has shown to be essential for sound wooden walls will probably be omitted. Sheathing will be put on crosswise instead of diagonally, in spite of the fact that every capable contractor knows that diagonal sheathing is essen-

tial to the life of these walls. Two nails will be used at the base of studs where four should be used. The walls may not be designed to eliminate horizontal timber and consequent shrinkage to be followed by cracks and settlements. If the walls are of masonry the mortar may be thin and weak, the brick courses not straight, the bricks themselves not fully imbedded in the mortar. Window frames set in these masonry walls may not be caulked with oakum, or the exterior joints sealed with caulking paste. Frames may not be secured in the masonry wall. Mortar joints not pointed smoothly. If siding is used to finish the walls an inferior kind of wood may be used, wood with knots, not thick enough, not accurately mitred and nailed at the outside corners, the nails not set below the surface of the wood to receive putty. Adequate insulation may be omitted from these walls, or if used may not be sealed tightly so as to be really efficient. Sheathing paper may not be constructed so as to provide real wind proofing nor tightly flashed about the openings. Proper metal flashings over window caps may be omitted.

Then the wall will get out of plumb, plaster will crack, the mortar will wash out, the brick work will look crooked, ungainly—an offense to order. Siding boards will crack. Pitchy knots and sap will ooze and stain the paint. Cornices will open. Walls will be damp inside. Cold walls will collect condensation and heat will be lost. The furnace will be fired more often. Burning fuel costs money which might have been saved if put into the walls. The house will get old and cold before its time.

Third.—This cheap house may not have good beams or joists. Bracing and bridging may be omitted. Inferior grades of lumber may be used with sizes too small to support the load adequately. The joists may not be doubled under partitions, or around chimney stacks, or around stair wells. The plumbers and heaters and electric wirers may cut joists where they desire without respect to consequences. Subfloors may not be laid diagonally, again insufficient nailing will be evident.

If the floors sag and crack the plaster on them will certainly crack. If the contractor uses 2×8's in place of 2×10's, as the architect required for second story floor joists, he is saving one of many little items that must go to make up the $1,000 difference. The saving may be important to him, but one finds these savings afterwards in depreciations, in cracked plaster. Heavy partitions not properly supported must make joists sag. That cracks plaster. Light pieces of framing to support heavy loads can not be seen when painted or plastered over, but they certainly show up later on.

Fourth.—The cheap house may not have good plaster. The lath may

be spaced too closely to get plaster keys. They space them that way to save plaster. Some lath may have bark upon them or pitchy knots. They may be twisted. They may not be thoroughly wet down before the plaster is applied. There may be no metal reinforcements at angles and corners or over wide expanses of ceiling. The plaster may not be forced thoroughly onto the lath so as to squeeze between them and make the essential keys. It may be too thin. It may not be finished straight and true. Tool marks may show. It may not be run beyond the edge of casings so that rough plaster shows around these margins. The plaster plane may not be furred away from chimney stacks.

Common plastering would probably not be considered in the category of the fine arts. But it is nevertheless true that fine plastering is by no means common. In these cheap houses we recognize cheap plastering from cracks, bulges, loose areas and, in time, areas fallen off. Poor lath stain the plaster. Where reenforcements are omitted there will be cracks. Rough places in the plaster always show. Plaster applied directly to chimney stacks gets damp, discolors. Cracks show where chimney stacks join the walls.

Fifth.—The cheap house may not get good roofing. Thin, flat sawed, wooden shingles may be substituted for the thick, edge grain quality that good contractors use. Light weight felt and asphalt composition shingles may displace heavier weights in this type of roofing. Metal flashings may not be turned under the siding or into the brick work. The rafters may be too light. The drain troughs may be of light metal, not properly pitched to drain.

Then the shingles will curl and let water down into the house, or they will catch brands and there will be roof fires. The metal will rust. The gutters will leak. The thin asphalt shingles will look like feathers on a fowl in a gusty wind.

Sixth.—The painting may be inferior; put on too quickly, or in coats that are too thick. Substitute ingredients may be used. The paint film itself may be of poor quality and the workmanship hurried. It may not be well brushed into the wood. The nails set below the surface will not be puttied over. Sanding between the coats may be omitted.

One can tell a cheap painting job every time. Such paint films graze, chip, fall off, peel. They collect soot and dust too quickly, knot holes and nail heads show through. The varnish wears out too quickly. It is unreasonable to expect the subcontractor who has to do his job in hurry up time to wait long enough between coats to allow them to oxidize, or to

sand them carefully, or to keep the wind from blowing upon them, or to struggle with the dust problem. Part of the $1,000 has to come out of paint. It comes out of materials and proper workmanship.

Seventh.—These cheap houses may not have good millwork. The wood finish then will be rough and splintery. Pieces that should be housed together will only be nailed. There will be no attempt to match grain. Long casing strips will not be lap jointed. Hammer marks will show. Doors and drawers will not move freely. Stairways will be put together with nails instead of with wedges and glue. Flooring strips will not be driven up closely together. Pieces will not be selected to avoid over contrasts of color. The floor will not be sanded carefully. The woodwork will not be thoroughly kiln dried or handled in the building so as to get it in place quickly from the kiln. It will be put on the walls before they are dried out.

Time must be saved. There is as much difference between grades of millwork as there is between automobiles. The cheap contractor must buy his millwork where it costs the least. He must put it in place quickly. Of course it will be splintery; drawers will not slide readily; veneers will peel off; stiles and rails will show open joints; cracks will appear between the flooring strips; the wood in the cabinet work will shrink and fall apart. Your cheap and inferior wood working mill can supply a bill of finished work for a six-room house for more than $200 less than the good mill must ask for it. Unless one is initiated he cannot tell the difference. To the expert the difference is apparent at the very first. To the uninitiated the difference shows up later on. That's the pity of it.

Eighth.—The cheap house may not have good plumbing. Joints between pipes may not be tightly caulked. Faulty piping may be used. Drains may not be properly pitched to avoid future stoppages. Cleanouts may not be installed where drains change direction. If the frame work of these cheap houses is not designed to take the horizontal runs without cutting the joists, the plumber will have to cut them. Most of the time they do get cut. In the cheap house they always get cut. The fixtures themselves may be of low grade, rough enamel, inferior mechanisms, noisy. Steel piping may be used where brass or copper should be employed. The service water heater may be inefficient.

Then one looks for leaks and ruined decorations. The home owner calls in the plumber to clean out stopped piping. He worries over fixtures which he thought were to be the best. The hacked out joints may fail.

Ninth.—Your cheap house may not have good heating. One may pay $200 for a warm air furnace or one may pay $600 for it. They have much

the same external appearance. A cheap furnace may be too small. The castings will be too light. The leads may not be taken off the bonnet proportional to the requirements of the rooms served. The radiators will not be leak proof. Returns for recirculating the air may be inadequate, improperly located. The casings may not set properly and may not be made gas tight. And if the heater is for hot water or steam the pipes may be too small, not properly pitched to drain. There may be an insufficient amount of radiation, awkwardly set radiators, thin pipe covering or none, inadequate insulation on the heater itself, the heater may be too small.

These inadequate house heaters installed may look like the finest job, but when they leak gas and smoke they ruin draperies. When they must be forced to keep the house warm the over heating warps casings, ruins grates. Improperly pitched pipes make radiators knock. Undersized pipes or those not designed for the load upon them make radiators heat unevenly or not at all. Omitted insulation throws heat into basements and is lost.

Tenth.—Your cheap house must have cheap hardware, cheap lighting fixtures, insufficient outlets. Spun brass substituted for solid bronze may be finished like brass or bronze and when new is undistinguishable from the latter, but the finish wears off. The black wire screening that replaces bronze must be replaced itself after a few years. The cheap house does not have well-fitted storm sash. It does not have tile flue liners. It does not have thick stucco planes. Good cement work is a rarity. Hundreds of items like this make up the $1,000 difference.

As one reads over this list no doubt one can readily see that they are principally matters concerned with workmanship, though in some cases of inferior materials. Unless the house owner who builds the house is technically trained and knows materials and workmanship, or unless, realizing his inadequacies, on these subjects, he has someone on the job who does know about these things—an architect—the cheap contractor can do his worst almost without the home builder being aware of it. Thus, I say the lowest bidder may be the most expensive one.

The man who offers to build the house for $1,000 less than the others is no more efficient, has no better ability to buy his materials at lower cost, probably does not figure to take any less profit on the building of the house. He gets the job by under cutting the price with the intention of getting out without loss by beating the game a little on every contract and subcontract, on every item of workmanship and materials. There are thousands of houses built like this in every large city of the land. The upkeep on these buildings is enormous. The strain on the underlying financ-

ing would make our mortgagees grow grey before their time *if they could know how thin is the margin of their security*. When the home builder takes a house like this, with its inflated future depreciation and high cost of upkeep, it is only fair to say to him that his house ownership will be more expensive to him than paying rent.

FORTY REASONS WHY WALLS AND CEILINGS CRACK[1]

Everyone is familiar with cracked walls and ceilings. Sometimes the reasons for the cracks are evident to everyone, but at others the reasons are not so plain to be seen. Sometimes the materials used are thought to be at fault when the real underlying cause of failure is that good materials have been used too sparingly or in a wrong manner. The best materials in the world, used without taking into consideration the limits of their strength, or not put together after ways that have been tried and proven, will not give complete satisfaction.

It is unfortunately true that thousands of small homes have been built and are being built which in a comparatively short time will deteriorate outrageously. It is a waste of money to use good materials in an unwise way. The jerry builder who puts these materials together so that they do not stay put is really either making you the victim of his ignorance or else at your expense is indulging in a form of legalized robbery.

Following are some of the reasons why walls and ceilings crack:

Building a house on a fill.

Failure to make the footings wide enough.

Failure to carry the footings below the frost line.

Width of footings not made proportional to the loads they carry.

The posts in the basement not provided with separate footings.

Failure to provide a base raised above the basement floor line for the setting of wooden posts.

Not enough cement used in the concrete.

Dirty sand or gravel used in the concrete.

Failure to protect beams and sills from rotting through dampness.

Setting floor joists one end on masonry and the other on wood.

Wooden beams used to support masonry over openings.

Mortar, plaster, or concrete work allowed to freeze before setting.

Braces omitted in wooden walls.

Sheathing omitted in wooden walls (excepting in "back plastered" construction).

[1] In *Small Home*, October, 1925.

Drainage water from roof not carried away from foundations.
Floor joists too light.
Floor joists not bridged.
Supporting posts too small.
Cross-beams too light.
Subflooring omitted.
Wooden walls not framed so as to equalize shrinkage.
Poor materials used in plaster.
Plaster applied too thin.
Lath placed too close together.
Lath run behind studs at corners.
Metal reenforcement omitted in plaster at corners.
Metal reenforcement omitted where wooden walls join masonry.
Metal lath omitted on wide expanses of ceiling.
Plaster applied directly on masonry at chimney stack.
Plaster applied on lath that are too dry.
Too much cement in the stucco.
Stucco not kept wet until set.
Subsoil drainage not carried away from walls.
First coat of plaster not properly keyed to backing.
Floor joists placed too far apart.
Wood beams spanned too long between posts.
Failure to use double joists under unsupported partitions.
Too few nails used.
Rafters too light or too far apart.
Failure to erect trusses over wide, wooden openings.

You will see that most of the causes of cracks are based on an improper use of materials. The home builder not being an expert may wisely question whether he can expect to avoid these consequences.

There are only two ways to do this. One is to employ a high-grade contractor who has a reputation for honest and intelligent dealings. The other is to employ an architect to conserve your interests. The combination of the two—good contractor and supervising architect—are a guarantee that you will get your money's worth and that your home will cost less in the long run.

4. Building in Winter

WINTER CONSTRUCTION[1]

With due precautions and proper equipment nearly all construction work can be carried on in winter and at no great difference in cost. The

[1] Adapted from *Seasonal Operation in the Construction Industries* (results of findings of a committee of the President's Conference on Unemployment, U.S. Dept. of Commerce, 1924), pp. 5–7.

owner may often profit by saving interest on his investment and by securing earlier use of the structure. Although equipment needed for protection and artificial heat in winter construction requires some expenditure and there may be some increase in overhead on the job due to delays from winter storms, these items often may be offset by the saving in salaries and the reduction in the contractor's general overhead. Labor in general is more efficient as skilled workmen can be more easily obtained. Although relative unit costs of labor in winter and summer vary with the class of work, the cost in winter, especially under first-class management, may be actually less than the cost at other seasons. . . . . Building materials usually can be obtained at somewhat reduced prices because of the smaller demand.

As the methods of handling winter work develop, and as manufacturers, supply dealers, and labor take more interest in encouraging winter work, the cost can be appreciably reduced.

Home owners are the largest single class of property owners, and residential building forms the largest single class of construction. The opportunities of home owners and home builders to remedy present conditions may be taken as an example of what building owners of all classes may do.

Repair work and new construction should be classed separately for a number of reasons. Repair work of a minor character is usually paid for on a time basis; that is, the owner pays a fixed rate per hour for the services of the men engaged. When this is done during a period of inactivity in a given trade the most efficient workers are ordinarily available, and they are able to do a better job in less time than less skilled men who might perform the work during an active period.

Home owners from time to time employ building trades workers to do outside and interior painting, to put on new roofs, to make alterations and additions to plumbing systems, to overhaul and repair the heating apparatus, and to do interior remodeling, such as changing partitions and laying tile floors in bathrooms. They also require grading of grounds, the construction of driveways, and erection or enlargement of garages and other outbuildings. Then there are sidewalk repairs, laying of concrete or masonry floors in the cellars, waterproofing, replacing awnings and screens, and repairs to exterior woodwork. The time chosen by the owner for such work is of importance to himself and to the community and bears a close relation to the general cost of living.

The man who builds a home for himself wants to get the best possible

house for his money, and in some cases he has to defer building until his savings accumulate. He is more vitally concerned in having his work performed economically than almost any other class of owners, but in all too many cases he "follows the crowd" and not only pays extra for the privilege but has to put up with a slower and less satisfactory job. Most home builders suffer from not having their plans and other arrangements made in advance of the time when they are ready to go ahead. But the number who consult their architect and contractor as to the best time to go ahead is increasing; and as it increases, the construction industry is able to render better service at less cost. The man who builds a house serves his own interest and the public interest by starting work at the right time. The right time usually means when other customers are not rushing into the field. Since the building of the home requires only a few months, it is not ordinarily difficult to plan the work with reference to probable labor conditions. . . . .

Those who build houses to sell or rent have similar reasons for wishing to obtain the benefit of low building costs, but in communities where there are fixed leasing dates or where there is a demand at some particular time of the year, they must also take that into account. . . . .

DIRECT AND INDIRECT SAVING BY WINTER CONSTRUCTION[1]

The contractor who is faced with the possibility of continuing operations during the winter months should ponder on the following statements issued by the New York Building Congress:

1. The direct additional costs due to construction carried on in cold weather are but a small percentage of the total cost of a building.

2. Such direct winter costs are more than offset by savings in other ways.

The indirect savings which more than counterbalance winter costs may be enumerated as follows:

1. Labor bonuses are eliminated.

2. Labor turnover is reduced.

3. Spread in overhead expense of contractors throughout the year reduces organization and equipment costs.

4. Tendency of contractors to lower their margin of profit with the idea in mind of securing sufficient work to keep their organizations intact during the winter months.

[1] From *Akron Builders' Bulletin*, December, 1925.

5. Seasonal discounts on materials.

6. Seasonal rates by transportation companies in order to relieve the congested periods.

7. Saving in interest and taxes on investments lying idle.

8. Earlier return on investment.

Contractors who still conform to old customs must now conform themselves upon the possibilities for continuing work throughout the winter months or lose out in the race with men who are more modern in their ideas and practice.

5. The Contractor

DUTIES OF THE CONTRACTOR[1]

The man who is paid to construct the building, whether an old-fashioned craftsman or a soulless corporation, is referred to as the Contractor, and it should be obvious that the more experienced, reliable, and painstaking the builder, the more satisfactory the operation and the final results will be.

In country districts, when the landholder calls on his neighbors to assist in a barn-raising, and the heavy posts and trusses assembled on the ground are hoisted into position in one afternoon, the most intimate relation occurs between owner, contractor, and workman. At the other extreme is the two-family house in the suburbs, aiming at showiness and built on speculation, where the contractor usually acts as the architect. In this case a minimum original cost outweighs any consideration of permanence, and the future owner is left to discover the faults of construction as they make themselves known, one after another. Between these two types lies the province of the average citizen.

For the homeowner the new construction is of grave and intimate importance, and, as he is not likely to be familiar with the details of construction, a relationship of mutual confidence with the builder is vital to his peace of mind.

SELECTION

It is customary to select the contractor for building a house either directly—when his character and ability are known to the owner—or else on the basis of competitive estimates.

The first method is recommended where the owner knows he can maintain a friendly relationship of give-and-take with a certain builder, and

[1] Adapted from *The House Beautiful Building Annual, 1926* (Boston: Atlantic Monthly Press, 1926), pp. 7–8.

it is usually adopted where the number of builders from whom a choice can be made is limited.

With the second method there are two procedures: (1) A limited number of desirable firms may be invited to submit estimates. Because the competition is restricted the bids will be moderate rather than remarkably low, but the owner will find that the slight additional cost will be compensated by the friendly coöperation and reliability which may be expected from a well-selected firm. (2) An unlimited competition may be held, in which an inexperienced or unreliable contractor may submit the lowest bid and, if accepted, future conflicts or inferior workmanship are bound to follow. In common fairness no one should be allowed to give the time required to figure plans and specifications if the owner does not want him to do the work.

SUBCONTRACTORS

In the erection of the average house many trades take part. If it is a simple wooden cottage in the country, the local carpenter and handy man is usually competent to do the entire work, with the assistance now and then of a plumber or a mason from a neighboring village. Trade unions, hours of labor, and even the exact compliance with the contract and the drawings count for but little under these circumstances.

In metropolitan districts the situation is much more complicated in that each trade is highly organized and jealous of its prerogatives, specialized labor and machinery are available, and all agreements must be carefully drawn and scrupulously observed.

It is customary to employ one contractor for the general construction, and allow him to select the more important subcontractors for the heating, plumbing, and wiring, and his minor subcontractors for the masonry, roofing, plastering, and painting. Thus the coördination of the work is under one head and yet the responsibility for its completion is ensured both by the general and subcontractors. Owing to the added responsibility for the general contractor, it is customary for him to include as part of his profit, which is distributed through his bid, a commission on the bids of the subcontractors; but where there is competition for the main contract, he will cut his profit to a very small percentage.

If the owner employs the subcontractors directly for a few of the larger items, the responsibility for their coöperation is largely shifted to the architect, and his fee is correspondingly increased, since he is taking over part of the general contractor's work. Often a better choice of mechanics may be made in this way, and there is no danger of the builder "shopping

out" the subcontracts to undesirable firms. For small residences this method is not advisable.

A successful combination of these methods may be economically employed in projects of $20,000 or over, by the architect taking separate bids on the heating, plumbing, and electric wiring and then allowing the general contractor to take over these figures as an allowance to be included in his estimate, with the understanding that the firms nominated by the owner shall be employed to execute their parts of the work. This involves no extra fee to the architect, and, if the general contractor submitted his bid in competition, his commission or profit on the subcontractor's work would be reduced to a minimum, as he knows that reputable firms will be employed, and that he cannot pad his own figures if he wants to get the job.

SUPERVISION

The architect's duties require him to follow the progress of the work from the first excavation till the last workman is out of the house, and the owner should also keep in close touch. Neglect of the contract requirements or slovenly execution can be corrected before it is too late, and where modifications are optional, such as the texture of the brickwork, the color of the paint, or the exact location of a light fixture, the owner can obtain what best suits his particular desires. He should remember, however, two points. First, that he cannot demand changes from the contract drawings and specifications without readjustment of the cost; and second, that his experience in technical matters is more limited than that of his architect or contractor. A fussy and querulous owner may break down the morale of an entire building-crew and their boss, but a tactful and enthusiastic observer may stimulate the contractor to friendly concessions and the workmen to real craftsmanship.

If the progress is not satisfactory, a frank conference between owner and contractor, in the architect's office, will often assist matters. It is best to avoid discussions on the job in the presence of the workmen. Care should also be taken that instructions be given to foremen or to the contractor himself, rather than to individual workmen. Orders for any changes should go through the architect's hands and be confirmed in writing. . . . .

SUMMARY

Durable construction is an important consideration in building dwellings as (1) rebuilding is costly, (2) poor construction means high maintenance cost, (3) dwellings poorly constructed if combined with unde-

sirable architectural design will soon become obsolete. Duration of construction does not depend so much upon kinds of materials as on grades and manner of construction.

Wood, brick and brick veneer, stucco, hollow tile, concrete and stone are the most common building materials used in house construction. Wood has long predominated. Steel also is coming into use. Wood shingles, composition shingles, tile, and slate are commonly used for roofing. The most important consideration in insulation materials is the thickness of the material which is to be applied providing the choice is of those classes of cellular or fibrous materials. Interior woodwork includes cabinet work, interior paneling, molding, door and window frames, built-in arrangements, and stair parts. Millwork is not only cheaper than specially-made woodwork but it is now being made most attractive and satisfactory. The most common finish-flooring material is wood, but others of excellence are linoleum, rubber tile, cement, slate, and various composition materials. New building materials improved by extensive research and experimentation easily and quickly erected are now on the market. Steel is one of the new materials used in the house-building field, and the experiments in it indicate that the time in building is considerably lessened through the use of factory-made members.

Poor foundations and walls, inferior beams and joists, poor plaster work, leaky roofs, inferior painting, cheap millwork, and cheap plumbing often make maintenance so expensive that ownership is a burden.

With proper equipment and precaution nearly all construction work can be carried on in winter, and often at less cost.

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CHAPTER VII

HOME LIGHTING

REQUIREMENTS FOR GOOD HOME LIGHTING[1]

No hard and fast rules can be laid down as to what represents the best practice in lighting the various rooms in the home; there are, however, certain fundamentals which should be observed in order to secure the best results. First, the light must be comfortable. It must not be glaring or excessively brilliant as glare produces eyestrain and irritates the entire system. Likewise extreme contrasts are objectionable as is noticeable where very bright areas are adjacent to rather dark ones. Second, the luminaires should be artistic and appropriate, in addition to being utilitarian in character. The luminaires should not only exist for the purpose of supplying light, but also should be as much a part of the room decoration as are the draperies, carpet and furniture. As a rule the simpler designs are more pleasing, while complicated and cumbersome decorations which serve no really useful purpose should not be tolerated. Third, advantage should be taken of the adaptability of modern light sources to color modification, and the light should be toned to suit the decorative scheme. Light is now produced so efficiently that color effects can be secured at a reasonable cost.

Some essentials to consider in providing and improving the artificial lighting of various rooms in homes have been gathered from a number of sources for brief presentation.[2] The rooms selected are those where eyestrain will result from using the eyes without sufficient and proper il-

[1] Adapted from *Eyesight Conservation Survey* (New York: Eyesight Conservation Council of America, 1925), pp. 154–58.

[2] A. L. Powell and R. E. Harrington, "Home Lighting: How To Make It Comfortable and Effective," *Illuminating Engineering Society Transactions*, XIV, No. 8 (November, 1919), 394.

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lumination, and are those found in the majority of homes. Certain parts of the home where light is required but where close work with the eyes is usually not required, such as porches, halls, pantries, garages and basements, have purposely been omitted. These should not, however, be overlooked in the plans for the lighting.

LIVING ROOM

(1) *Requirements.*—Whether it is called the living room, parlor, library or den the lighting of this room should receive special attention since this is where the social life of the home is centered. The widely diversified uses call for different combinations and arrangements of the lighting.

a) For general purposes the most comfortable and useful arrangement is to have a medium intensity of general illumination supplemented with more brilliant light sources at various points.

b) When used for large gatherings, it is desirable to have a relatively high intensity of evenly distributed general illumination.

c) When used by only one or two persons it is often preferable to have no general lighting with merely a certain area illuminated.

(2) *Approved practice.*—In most cases ceiling fixtures or concealed indirect light sources should be used for general illumination, portable lamps for local lighting, and wall brackets and portable lamps for decorative effect.

a) Ceiling fixtures such as candelabras, semi-indirect bowls and showers should be shaded to softly diffuse the light and widely distribute it to all parts of the room.

b) *Portables.*—There are innumerable styles of table lamps, desk lamps and floor lamps suitable for reading, working at desks, sewing, playing games, music, etc. In selecting these, utility need not be sacrificed for attractiveness. They should be so shaded as to eliminate glare completely.

c) Wall brackets and small decorative portables greatly assist in artistic effect, but they should generally be restricted to this use alone.

DINING ROOM

(1) *Requirements.*—In the dining room the requirements to be met are particularly definite.

a) Good illumination on the table itself.

b) Soft but adequate illumination on the faces of the diners.

c) A lower intensity of illumination throughout the remainder of the room.

(2) *Approved practice.*—The following fixtures can be used either singly or in combination.

a) Domes should be of such shape and hung so as to conceal the light source from the eyes of persons seated at the table.

b) The central candelabra is least effective in meeting the requirements of dining room lighting. The light sources should be shaded to avoid glare and direct the light on the table.

c) Showers are satisfactory if great care is taken to suspend them at the correct height and to shade them so that bare light sources are not exposed to the eye.

d) Semi-indirect bowls are satisfactory from the standpoint of comfort but they do not give the pleasing contrast of light and shade which is desirable.

e) Portable lamps meet all the requirements provided they are properly shaded.

f) Wall brackets are merely decorative and should be sufficiently shaded so as not to annoy the diners.

KITCHEN

(1) *Requirements.*—Good, general illumination of daylight qualities is required throughout the kitchen, because of the wide variety of work that is done.[1]

(2) *Approved practice.*—The choice of fixtures depends upon the size of the room.

a) In medium-sized kitchens an enclosed diffusing globe placed close to the ceiling at the center is a satisfactory installation. Light colored walls and ceilings are, however, essential.

b) In large kitchens two or more ceiling units may be necessary and if local lighting in addition is required, properly-shaded wall-bracket lamps over the sink or stove will be found useful.

BEDROOM

(1) *Requirements.*—A moderate intensity of general illumination throughout the room with higher intensity of local lighting at certain desired points.

[1] The various work surfaces also should be well lighted and lights so arranged that all surfaces are free from shadows.

(2) *Approved practice.*—

a) General illumination should be provided by a semi-indirect bowl or adequately shaded unit so that there is no glare in the eyes of a person lying in bed, as in the case of an invalid.

b) Wall brackets on either side the dressing table and chiffonier are most desirable. These may be mounted on the furniture and connected to an attachment receptacle, like portable lamps.

c) Portable lamps are useful in bedrooms on dressing tables and tables at the side of the bed.

BATHROOM

(1) *Requirements.*—For the bathroom of average size the lighting at the mirror is the chief problem.

(2) *Approved practice.*—The proper way to light a bathroom is by two wall brackets, one on each side of the mirror. It may be desirable to have a central ceiling fixture for general illumination.

IMPROVING OLD INSTALLATIONS

One of the principal reasons why the light is so bad in many homes is that no change has been made in the original installation to keep pace with the rapid advancement in lighting practice. This is particularly true in homes that are rented, inasmuch as the occupant quite naturally is unwilling to make permanent changes which he cannot move away when he leaves the house. It is possible, however, at very little expense to greatly improve old lighting installations with removable equipment which will remain the property of the buyer. The two principal ways in which existing fixtures can be modified so that the advantages of modern illumination may be enjoyed in a considerable measure are:

(1) By shading all bare lamps to reduce brightness and to eliminate glares and shadows. This may be done by using glassware reflectors or shades, enclosing globes or bowls.

(2) By the extensive use of portable table lamps, floor lamps and small ornamental lamps. Some rooms can be adequately lighted by these alone.

HOUSE WIRING AND LIGHTING[1]

If you intend to wire your new or present home and you wish to secure a maximum of convenience and satisfaction from the use of electricity,

[1] Adapted from *House Wiring and Lighting for Service.* New York: Good Housekeeping Institute, 1930.

you must look not only to your present but to your future needs. Study carefully the wiring plans of your architect and do not hesitate to add any outlets that you feel you may need in the future. Usually we rely too much on the builder or on the architect, and give too little attention to our actual wiring needs.

Remembering that electricity is not only a source of light, but is also a source of heat and power, your planning problem may well be divided into two parts. The first will have to do with the arrangement and nature of your lighting, and the second with the provisions for heating and power devices. The kind of lights, their location, and the type of fixtures will depend largely on the decorative scheme you are following. The number of receptacles for the connection of devices such as percolators, toasters, grills, vacuum cleaners, etc., will depend on which of these you are planning to use, and the location of the receptacles will depend upon the layout of your rooms and the arrangement of the furnishings.

Secure a floor plan which will show clearly the relationship of the rooms in your home, and mark on this plan the location of the furniture that you intend to use. A convenient way to do this is to cut small pieces of cardboard to represent the various pieces of furniture, using the same scale as is used for the floor plan. Shift these around on the plan until you get an arrangement that suits you. If you follow this plan, you will find that it is relatively easy to determine where you wish to place your lighting fixtures and the receptacles for attaching devices. This procedure will eliminate a thing that frequently occurs; namely, the placing of fixtures and receptacles in locations that are either inaccessible or in the way of furniture. Plan the wiring in this way for each room in the house, keeping in mind just what devices you intend using. It is well to remember that each year additional types of labor-savers appear on the market, and in laying out the receptacles it is best to be liberal, particularly as the cost of added wiring is usually in access of the cost of providing it initially.

When you have an idea of what you want, it will then be advisable to call on your electrical contractor for his advice. A contractor who knows his business can give valuable assistance in laying out your wiring. Be as careful in choosing the man to do your electrical work as you are in choosing your builder or plumber. There is just as much variation in the class of work done in the electrical field as in any other, and, although regulatory bodies such as municipal inspection authorities and fire underwriters prescribe certain standards that must be met in wiring homes, there is a wide difference between the contractor who does his work so as

just to pass inspection, and the one who gives you the best. It is well to be suspicious of the contractor whose only recommendation is the cheapness with which he can do the work. If you are not acquainted with the contractors in your neighborhood, consult the local lighting company, which doubtless can tell you who will do a satisfactory job.

After you have decided on your layout, it will then be time to choose the type of construction. There are various kinds of house wiring, all of them made necessary by the fact that the wires which actually carry the electric current must be protected from injury. The class of wiring that is considered the best for practically all conditions is the so-called rigid conduit system. In this type of construction iron pipe similar to gas piping, but specially treated against corrosion, is run between the walls and ceilings from the fuse panels to the various outlets for fixtures and receptacles. The piping system is continuous between the outlets, which are themselves specially-designed metal boxes. Insulated wires of the proper size are drawn through the pipes and connected with the fixtures and receptacles. This type of construction gives a maximum of protection and is considered the best for a permanent installation, but is not generally feasible for finished houses. Under certain conditions flexible metallic conduit is used instead of the rigid type.

Another excellent system of wiring, particularly for finished buildings, uses so-called flexible steel-armored conductor or cable. This consists of insulated wires permanently encased in a double layer of steel armor that is wound spirally around the conductors in such a way as to make the whole fairly flexible. This armored conductor is pulled from the outlet to outlet in walls or under floors and is entirely concealed. In completed buildings this type of wiring can be installed, if done carefully, with practically no marring of walls or woodwork. In finished rooms, where it is not practical to run concealed wiring, it is still possible to get outlets for lights, or device receptacles by using metal moldings on walls or ceilings. This molding is unobtrusive and makes a very satisfactory installation. In some localities it is permissible to use other types of wiring, such as wiring in wood molding or so-called knob-and-cleat wiring in partitions and under floors. These latter, however, are not generally considered the best types of construction for homes.

The next step in your wiring plans is the choice of fixtures and fittings. Almost always considerable thought is given to the selection of lighting fixtures, for the form, style, and finish of these must harmonize with the surroundings. Very few people, however, give a thought to the lamp

sockets, the switches, the device receptacles, etc., which are really a very important part of the wiring system. To most of us one switch is just like another, and a socket is s mply a socket. However, there is a wide enough difference in the quality of fittings of this sort to warrant the prospective purchaser in insisting that the contractor shall furnish those made by manufacturers of experience and good reputation in this line.

. . . . It is just as true with house-wiring fittings as with most other things, that a low initial cost may not mean the cheapest in the long run, for the cost of replacing a defective switch, socket, or receptacle is usually much more than the difference in first cost between one that will just pass inspection and the best that can be purchased.

In wiring a house, as in many things in life, it is the attention to details that makes for comfort and convenience. With the same class of materials and the same grade of workmanship the actual wiring will be much the same for one house as for another, but the results, in terms of usefulness and satisfaction, will be in proportion to the attention given to the planning of details. Every house has its individual wiring problems, and it is not possible to give a master plan that will cover all cases. However, the same things that make for convenience in one home can be used in another, so that general suggestions may be applied to individual cases.

The company furnishing the electrical power usually owns and controls the service wiring outside the house, but the house owner has everything to do with the wiring inside the house. He can plan and operate it as he chooses, so long as he stays within the rules and regulations formulated for his own and the community's protection by municipal and other authorities having jurisdiction.

Although the meter that measures the current consumed is generally installed by the lighting company, the mounting for it must be put in place by the house builder. Right at this point it is possible, by using a little care in the location of the meter, so to plan that many steps will be saved for the housekeeper. Mount the meter at right angles to, or facing, a cellar window that is accessible from the outside of the house, or in a box or cabinet that can be built and secured to the outside of the building. This arrangement will make it possible for the lighting company's representative to read the meter without disturbing the household or tracking dirt through the rooms. If there are no cellar windows accessible from the street, have the meter mounted where it can be reached readily and, preferably, close to the point at which the service enters the house. Such a place frequently can be found in an extension or outside vestibule.

From the meter the main feed wires are carried to a distributing panel and connected to the various wires that go to the fixtures and outlets throughout the house. Each circuit is here equipped with fuses designed to protect the wiring against excessive amounts of current. The distributing, or fuse panel should always be placed so that it may be easily reached when a fuse blows. In many houses the fuse panel is mounted on a ceiling, where it is extremely difficult to get at, but there is no excuse for this. Have the fuse panel mounted on a side wall high enough to be out of reach of children, but convenient for those who may have to change a fuse Frequently a better location than the cellar can be found for the fuse panel—for example, space at the head of the cellar stairs or in the pantry. In large houses having many circuits, it is generally desirable to have more than one fuse panel—perhaps one on each floor, or one in each section of the house. The fuse panel selected should be of the design in which no live wires are exposed, for with this type fuses may be changed without any danger. These safety fuse panels are most desirable, and for his own protection the house owner should not countenance any other kind. A simple arrangement that further adds to convenience is a light so mounted that it will illuminate the face of the fuse panel. This should be on a circuit by itself, so that it will not be affected if trouble occurs and the fuses blow on any other circuits in the house. Another provision for convenience, which apparently is not generally appreciated, is the labeling of circuits and fuses so that they may be easily identified in case of trouble. Any one who has attempted to replace a fuse in the darkness, standing on a damp cellar floor, where the fuse panel was of the antiquated type with exposed wires carrying current, will most appreciate the type of equipment we are suggesting.

From the fuse panel let us trace the circuits to the various parts of the house and see what measures can be taken to get a maximum of convenience. Starting with the cellar, you will want sufficient lighting outlets on the ceiling to give good general illumination and perhaps additional outlets for wall brackets or drop lights near the work bench or storage shelves. At least one of the cellar lights should be controlled from a switch at the head of the cellar stairs. This is indeed a convenience and well worth the slight extra cost of the switch and wiring. The cellar is frequently neglected from the standpoint of appliance outlets—or "convenience" outlets, as they are now being called, but this is unfortunate, for sooner or later there is certain to be a need for them. For example, the use of automatic furnace regulators is becoming more and more popular.

One type of these operates the furnace dampers by an electric motor, which gets its current from the house service and, of course, an outlet would be required for this. Again the handy man of the house would appreciate an outlet by his work bench for the connection of a motor operated drill, lathe, or an electrically-heated soldering iron or glue pot. Then, too, many oil burners for furnaces have an electric motor for which an outlet is required. While you may not have all of these devices at this time, it is well to look into the future and plan your wiring accordingly.

The laundry, being one of the work rooms of the house, should have ample provision for the connection of labor-saving devices. A convenience outlet should be installed for the washing machine and, because it is often desirable to be able to iron while the washer is in operation, at least one additional outlet should be provided for the ironing machine or the hand iron. The lighting outlets should allow for a ceiling fixture to give general illumination, and perhaps for wall brackets placed high enough so that they will be out of reach, but so located that more light will be had over the work centers, particularly the ironing machine or ironing board. Both for safety and convenience it is desirable to have these lights controlled by wall switches.

On the first floor of the house, also, it is possible through little things to add to the convenience of your wiring. For example, you may have a light over the front door or on the porch ceiling operated from a switch mounted on the outside of the house just high enough to be out of reach of prankish children. This arrangement will eliminate fumbling for keyholes in the dark, an annoyance unnecessarily suffered by most of us. The same light can also be controlled by another switch indoors, so that it may be used to welcome the visitor or light him safely on his way. It is now quite a common practice to have the lower hall lights so wired that they may be lit or extinguished either from the upper or lower hall. This is accomplished by means of so-called "three-way" switches and a special arrangement of the connecting wire. It is not generally realized, however, that this same idea can be used to advantage in many other rooms. When you are going from one room to another—for example, from the living room to the dining room and then to the kitchen—if the lighting circuits have three-way switches, you can switch on the lights in the room ahead of you and switch off those behind you without retracing your steps. These three-way switches are truly step-savers and if the housewife realized their value from this standpoint, they would no doubt be much more frequently used. It is generally desirable to have an outlet in the hall to

which the vacuum cleaner may be attached so as to eliminate the necessity for connecting it to a lighting fixture or else running the cord across the floor to the adjacent rooms.

In the living room, outlets should, of course, be provided for portable lamps. While the convenience of having enough of these is becoming more appreciated, it is a fact that too few are provided in most homes. When portable lights are used exclusively for illuminating the room, it is desirable to have the convenience outlets to which they are connected wired to wall switches. This arrangement makes it possible to control the lights from a central point, which is not only a convenience but permits quick changes in the lighting effects. If you have a piano or phonograph operated by an electric motor, it is desirable to have a conveniently located outlet.

Almost every one is familiar with the many electrical appliances, such as percolators, toasters, grills, and waffle irons which are so well suited for use in the dining room. The maximum satisfaction from these will not be realized, however, unless adequate convenience outlets are provided to which they may be connected. One outlet is hardly enough, because it is generally desirable to have two or more of these devices in use at one time.

So many electrical devices are made for assisting the housewife in her cooking and kitchen work that ample thought should be given to the provision of facilities for the connection of these. There are electrically-operated mixing and beating devices, electric fireless cook stoves, refrigerating machines, dishwashing machines, and a host of cooking devices that may be connected to convenience outlets. If an electric range is to be used, heavier wiring will be necessary, as the current requirement is in excess of that permissible on convenience outlets and their wiring. Your range circuits should have a separate switch and fuses, and here you will find it convenient to install a so-called "safety" switch and fuse box, so that the fuses may be replaced easily and with absolute safety. Besides an outlet for a ceiling light it is frequently desirable to have outlets for wall brackets over the sink and other work centers so as to give a more concentrated light at these points. Both winter and summer the kitchen needs ventilation, and an electric fan or permanently installed fan ventilator unit will provide a satisfactory means of obtaining it. . . . .

Electricity is finding extensive use in bedrooms, for devices as well as for illumination. Curling irons, electric warming pads, milk bottle warmers, vibrators, etc., are conveniences for bedroom use. Portable lamps are

used frequently, and in some cases lighting fixtures are being attached to, or built into, the furniture. Naturally, outlets must be provided if it is planned to use any of these things. Both in the bedroom and bathroom, it is a comfort to have an auxiliary electric heater to take away the chill on cool mornings, especially when the house heating plant is not in operation. There is one type of heater that may be built into the wall, and this is a desirable form for the bathroom. Due consideration should be given to the provision of lights in large closets and storerooms, controlled by switches adjacent to the doors.

Care should be taken in the location of convenience outlets, otherwise they may be convenient in name only. Those outlets to which devices are to be attached will usually be most convenient if located at about elbow height, eliminating the need for stooping. Such outlets are those used in the kitchen, the laundry, for table devices in the dining room, and perhaps for special purposes in some of the other rooms. Those outlets to which more or less permanent connections are made, such as for floor lamps, are better placed low, so that the connecting cords will be out of the way and inconspicuous.

What constitutes good lighting for the kitchen? The foremost requirement is that the quantity of light shall be sufficient for the accomplishment of work with accuracy, speed and comfort. The next is that the source of light shall be so placed or located that there are no deep shadows falling on the work. A further requirement, linked with the others, is that the source of light itself shall not be so prominent that it attracts the eye or produces an exceptionally bright spot or glare.

How can we obtain this good lighting? Obviously to get sufficient light we must have enough light energy available at the source. In other words, we must use lamps of sufficiently high candle power. To soften the shadows a diffusing shade or reflector should be used, and to shorten the shadows the source of light should be located as high above the work as possible. To eliminate the disagreeable effect of exceptionally bright spots of light which produce glare, the reflecting or diffusing globe should be of such material or so designed that the lamp itself cannot be seen.

There are three general systems of lighting that are applicable to the kitchen. The first of these is the so-called "direct" system in which fixtures—or "luminaires" as they are sometimes called—are designed to throw the major part of the light directly upon the surface of work to be

illuminated. This system is perhaps the most common and is exemplified usually by a bell-shaped open-end shade or globe suspended from the ceiling or from a wall bracket. The second system uses a luminaire of such design that no light is transmitted through it but all is reflected to the ceiling, which in turn acts as a reflector to distribute the light to all parts of the room. This is known as "indirect" lighting. With the third system, a luminaire is used that permits some light to pass through it but still the greater portion of the light is reflected to the ceiling as in the indirect system. This form of lighting is known as "semi-indirect." By a proper selection and correct location of fixtures satisfactory illumination can be obtained in the majority of cases with any one of these three general systems.

If the direct system is employed, the general illumination of the kitchen may be obtained by having a central luminaire installed close to the ceiling. In large kitchens, particularly those that are long and narrow, two such fixtures will probably be necessary. It is important that the luminaire be mounted close to the ceiling so as to eliminate long shadows which result if the source of light is low. Generally speaking the major part of the work in the average kitchen is done at work centers placed along the wall, for example, the sink, the range and the kitchen cabinet. At these points the worker has her face to the wall and her back to the central luminaire. Now if the light source is hung low, her shadow will of course fall on the work she is doing. Even with a well-designed central fixture at the proper height the shadow cast by the worker may be deep enough to require additional lighting at the work center. This can be taken care of by installing another luminaire in the form of a drop light or wall bracket over the sink, the range, or the kitchen cabinet where needed. In this case an open glass shade with a diffusing bulb lamp will answer the purpose satisfactorily. This auxiliary light should be high enough, at least above the worker's head, and far enough from the wall so that the direct glare will not be in the worker's eyes. An enclosed type central luminaire and small deep shades of the open type for the individual lights over the work units frequently make an effective arrangement.

For the direct system of lighting there are two general forms of globes or shades, namely, the bell-shaped open type and the enclosed type. Both of these are generally made of an opalescent glass in order to diffuse the light. There are many different shapes of both the open and enclosed types, the distribution of light being more or less dependent on the shape.

In the indirect system, which is dependent entirely on the ceiling and

wall surfaces for the diffusion and reflection of the light, it is necessary, of course, to have these surfaces of such a character that sufficient light is obtained on the work without the necessity of using lamps of excessively high candle power. Experiments conducted by the laboratories of the Edison Lamp Works of the General Electric Company show that the reflection factor for ceilings tinted with various colors varies from 86 per cent for flat white to 72 per cent for a flat silver grey. For sidewall tints there is a variation of from 71 per cent for a flat ivory tan, to only 36 per cent for a medium blue. These figures indicate the percentage of the light falling on the ceiling or walls which is reflected to do useful lighting in the room. Obviously if the indirect system of lighting is to be used the lighter colors should be chosen for ceiling and walls to permit of economy in lamp consumption, for with the darker colors appreciably more light must be provided at the source in order to get the same effect on the work. What has been said about the effect of color in the indirect system of lighting applies just as well to the semi-indirect system which, as already stated, depends to a large extent upon the reflection from ceilings and walls for its effectiveness.

As previously stated the foremost requirement of good lighting in the work rooms is that the quantity of light shall be adequate. Lighting experts through many observations have determined just what illumination is generally required for doing many different kinds of work. For the work done in the kitchen it is usually considered that 8 to 10-foot-candles are necessary. The foot-candle is a unit of illumination and represents the light that would fall on a plane or surface one foot from a source of light of one standard candle power. Eight- or ten-foot-candles' illumination is equivalent to the light that would fall on a surface one foot from a light source respectively of 8 and 10 candle power.

MINIMUM WIRING STANDARDS[1]

Outside entrances.—One ceiling or one side outlet. One single-pole switch.

Porches.—One ceiling or one side outlet. One single-pole switch. One convenience outlet, 18 in. from floor, if floor area is in excess of 100 sq.ft.

Vestibule.—One ceiling or side outlet and one single-pole switch if floor area is in excess of 16 sq.ft.

Hall.—One ceiling outlet and one single-pole switch. If there are two doorways more than 10 ft. apart, two three-way switches. Convenience

[1] Recommended by the Electrical League of Cleveland (rev. 1928).

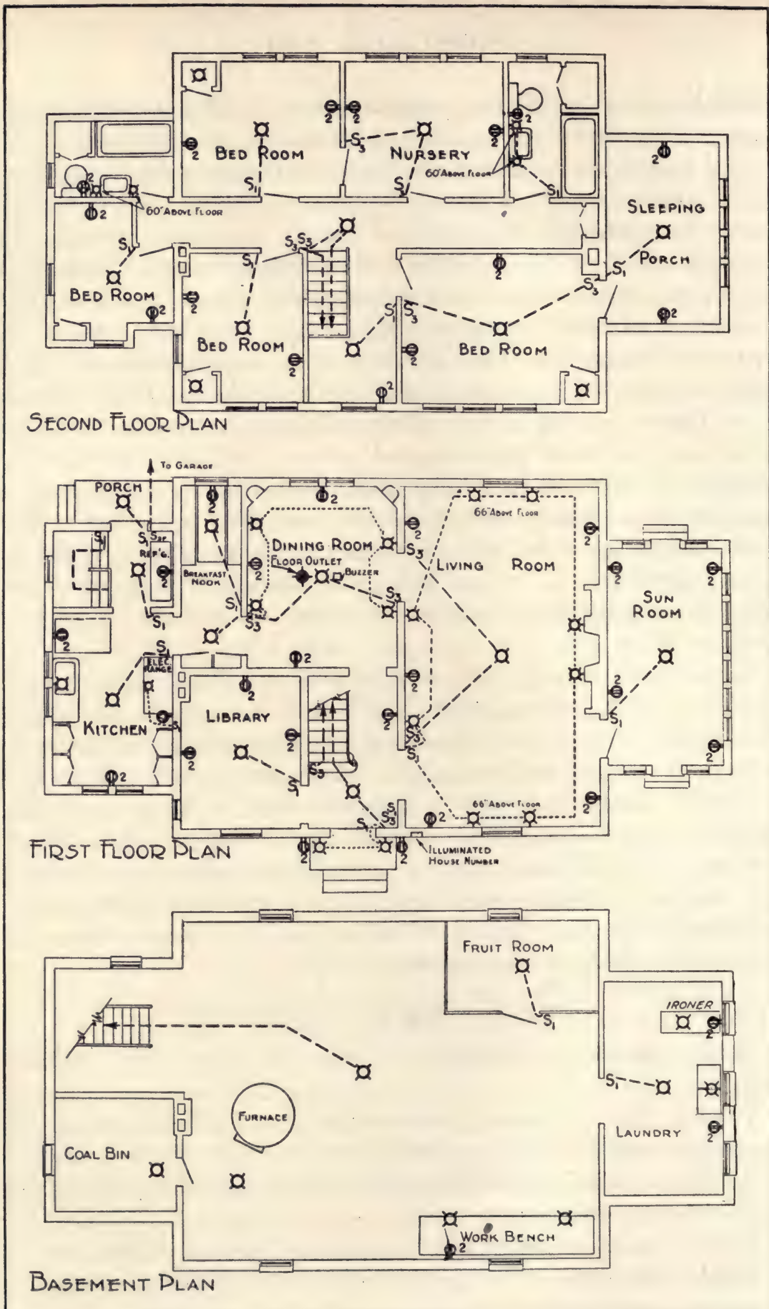

FIG. 45.—Wiring plan for a typical residence. From *Home Lighting Fundamentals.* By permission of General Electric Company, Nela Park, Cleveland, Ohio.

outlets—one for each 12 ft. of baseboard to be installed in wall or baseboard approximately 12 ft. apart.

Stair hall.—One ceiling outlet and 2 three-way switches. Convenience outlets—one for each 12 ft. of baseboard to be installed in wall or baseboard approximately 12 ft. apart.

Living room.—One ceiling outlet if room is nearly square. If length is more than $1\frac{1}{2}$ times the width 2 ceiling outlets, or 4 side bracket outlets may be substituted for one ceiling outlet or 6 side bracket outlets may be substituted for 2 ceiling outlets. For one doorway, one single-pole switch. For 2 doorways more than 10 ft. apart, 2 three-way switches. Convenience outlets—one for each 12 ft. of baseboard to be installed in wall or baseboard approximately 12 ft. apart.

Living room mantel.—Two side outlets in wall above mantel, or 2 convenience outlets in mantel shelf.

Sun room.—One ceiling outlet. For one doorway, one single-pole switch. For 2 doorways more than 10 ft. apart, 2 three-way switches. Convenience outlets—one for each 12 ft. of baseboard to be installed in wall or baseboard approximately 12 ft. apart.

Dining room.—One ceiling outlet. For one doorway, one single-pole switch. For 2 doorways more than 10 ft. apart, 2 three-way switches. Convenience outlets—one for each 12 ft. of baseboard to be installed in wall or baseboard approximately 12 ft. apart.

Breakfast room.—One ceiling outlet. One single-pole switch. One duplex convenience outlet just above level of table top.

Kitchen.—One ceiling outlet. For one doorway, one single-pole switch. For 2 doorways more than 10 ft. apart, 2 three-way switches. One ceiling or side outlet over sink controlled by switch or pull chain. One duplex convenience outlet 4 ft. high near sink.

Refrigerator room.—One ceiling outlet. One single-pole switch. One convenience outlet.

Rear hall.—One ceiling outlet. For one doorway, one single-pole switch. For 2 doorways more than 10 ft. apart, 2 three-way switches.

Hall, second floor.—One ceiling or side outlet. Two three-way switches. One convenience outlet 4 ft. from floor.

Bed rooms.—One ceiling outlet. One single-pole switch. Convenience outlets—one for each 12 ft. of baseboard to be installed in wall or baseboard approximately 12 ft. apart.

Closets.—One lighting outlet controlled either by pull chain or door switch, if floor area is in excess of 10 sq. ft.

Bath room.—Two side wall outlets, one on each side of mirror located 5 ft. from floor. One single-pole switch. One duplex convenience outlet at right of lavatory 4 ft. from floor.

Basement.—One ceiling outlet at foot of stairs controlled by a switch at the head of the stairs. One ceiling outlet located at or near the furnace. One ceiling outlet over laundry trays. One outlet in ceiling, 3 ft. in front of the center of laundry trays, for clothes washer. One convenience outlet.

NOTE.—The outlet for the clothes washer shall be equipped with a porcelain key socket hung $5\frac{1}{2}$ ft. from the floor.

Fruit room.—One lighting outlet.

Coal room.—One lighting outlet.

Garage.—Two ceiling outlets; one outside outlet; one duplex convenience outlet in center of rear wall, 4 ft. from floor.

[NOTE.—The Red Seal Plan of electric wiring inaugurated by the Society for Electrical Development is a service plan designed to help home builders. Red Seal installation are built from materials which conform to the requirements of the National Electric Code or any other code that has requirements in excess of the National Code. It does not restrict the home builder to any product or any particular manufacturer. The local electric league will plan the Red Seal layout. If the layout is adopted the league will inspect the work in progress. Upon completion the Red Seal certificate is issued to the building. (For additional information on the Red Seal Plan see "The Red Seal Plan of Electric Wiring," *Small Home*, December, 1928).]

SAFEGUARDING VISION IN LIGHTING THE HOME[1]

BY M. LUCKIESH

There is plenty of evidence that good lighting aids vision and is an economic asset. It should be observed that in most cases good lighting costs no more than bad lighting. If we take into account the harm which bad lighting does to the eyes, it is much more costly than adequate and proper lighting. Eyesight is so important and so easily injured that too much care cannot be exercised in its conservation.

Lighting conditions which cause eyestrain depend somewhat upon the state of adaptation of the eye so it is difficult to define in measurable quantities the limits of these conditions. Excessive brightness, like that of the sun or of modern artificial light-sources, is annoying and harmful to vision. The type of glare due to excessive brightness is blinding for some time after the light-source is out of the field of vision and this temporary blindness has been the cause of many accidents.

[1] Adapted from an address before the Eyesight Conservation Council of America. Published by the Council, 1925.

Excessive contrast, which in a sense is similar to the foregoing, causes eyestrain. A brightness which is quite endurable amid light surroundings may be quite discomforting amid dark surroundings. For example, a lighted lantern outdoors on a dark night or a lighted match in a room painted black is quite glaring; while a lighted incandescent lamp when viewed against the bright sky in the daytime is not very glaring.

The light from a wall bracket, which may be viewed with comfort against a light or medium gray wall, is likely to be glaring against a dark background such as dark wallpaper or darkly finished woodwork. Despite this, brackets with frosted lamps are found in many homes installed on a panelled background of dark woodwork or other wall-covering. A decorative fixture which is too bright may be improved by providing denser shades or lamps of lower intensity. In general, fixtures viewed against dark backgrounds are glaring even though the brightness is very low, but this is due to the fact that the contrast is too great. But there is little in favor of dark backgrounds in the home, for they usually contribute toward a depressing effect.

Light may be glaring by virtue of its quantity, but there is a common misconception regarding this. For example, complaints are often heard that artificial lighting is too intense. The intensity of illumination outdoors is usually thousands of times greater than ordinarily encountered in artificial lighting. Commonly, when a room is considered to be overlighted, the effect is merely glare from exposed light sources. Quantity of light alone is not uncomfortable to vision when the eyes are adapted to the proper level of illumination. When one enters a lighted room after long exposure to darkness the eyes are blinded until they have time to become adapted. Adaptation is an important factor in vision and by this function the eyes are capable of operating satisfactorily throughout a very extensive range of brightnesses or illumination intensities. The brightnesses encountered on a starlit night and those at noon on a sunny summer day represent a range of millions. Under proper conditions the eye will function comfortably throughout this tremendous range of illumination intensities.

Although the sky when viewed outdoors may not be annoying to the eyes, it is not uncommon indoors to find a patch of sky seen through a window to be very glaring. The eyes indoors are adapted to much lower brightnesses than outdoors and the contrast between the patch of sky and the adjacent walls is so great as to be annoying. This is a common cause of eyestrain indoors.

Unshaded light-sources should not be tolerated. Even exposed frosted lamps are glaring under most conditions. Shades should be dense enough to reduce the brightness of the lamps. Even though the bright light source is out of the ordinary field of view, it is annoying when reflected from glossy paper, polished desk tops, blackboards, etc. For this reason light should be emitted from a surface of low brightness. A practical solution is to surround the light-sources with diffusing glass or to diffuse the light by reflection from the ceiling.

Glossy paper is annoying because its smooth surface acts somewhat like a mirror. This is another cause of eyestrain and is contributory to such defects as nearsightedness. Where school children are required to read fine print on glossy paper under glaring or insufficient lighting, nearsightedness increases. The eyes of these young persons are immature and susceptible to permanent defects. In the home these causes of eyestrain should be eliminated before the decorative features of lighting are given attention. The eyes may be misused under any conditions if knowledge and care are not exercised and it is deplorable that such misuse is common.

It is an interesting fact that there is more eyestrain encountered under glaring lighting conditions when the eyes are called upon for near work, such as that of reading, than when they are merely in casual use. For example, in the shade of a building with the eyes unshaded a large expanse of sky may be only slightly glaring. However, as soon as the eyes are concentrated upon a page of reading matter and are engaged in the effort of reading, one becomes conscious of discomfort which in time may become unbearable unless the eyes are shaded. A similar effect may be detected indoors; that is, glaring conditions become much more annoying when the eyes are called upon for their best efforts.

The home and the school are natural and effective places for attacking some of the evils which contribute toward eye trouble. The lighting should be well done; householders and teachers should apply the principles of conserving vision; and in the home-economics courses lighting should be given the attention it deserves.

Although it is not difficult to obtain fixtures which are thoroughly satisfactory from the standpoint of the conservation of vision, there are many in use which are a menace to eyesight. It is easy to state that all lamps should be shaded from the field of view and to add certain facts regarding the correct position in respect to the light-source, but these simple statements do not appear to be effective. This suggests an interesting example of a misconception of art. The bespangled fixtures of the

Louis XIV period fitted appropriately the gorgeous splendor of that time. Catering to our weakness—and his own—for copying bygone art instead of creating new styles, the fixture designer reproduces those cut-glass fixtures. As objects, they may be beautiful, and as fixtures used with candles of a few centuries ago they would be delightfully scintillating. However, quite unconscious of the law of appropriateness and of the enormously greater brightnesses of modern light-sources, the architect, decorator, or someone else places our modern lamps amid crystals of glass. The glittering points of light are now a thousand times brighter than they were when this period style was born. They are glaring and unbearable. They are inartistic, despite the fidelity with which their dimensions and details have been copied. Such errors are committed in the name of art, but the result is no longer art.

The lighting problems in the home are not difficult to solve. The subject has been given a great deal of attention by experts and simple directions for various rooms are available.

WHAT HOME-OWNERS SHOULD KNOW ABOUT ELECTRIC SYSTEMS[1]

By H. VANDERVOORT WALSH
Assistant Professor of Architecture, Columbia University

Every year electricity is becoming more and more an integral part of our homes, making our living easier and adding to our pleasures. And yet, as obvious as this is, the average home-owner is less informed on the details of this equipment than other parts of the house. The heating plant and the plumbing are generally understood better. It is quite a bit easier to visualize the water coming into the house through pipes than to think of the strange power of electricity coming through overhead wires or underground conduits.

For the insulated and sheathed wires, the safety switches and fuses, and the simple controls of this force, we pay only about two to three per cent of the total cost of the house. Our lives are protected from any of its uncontrolled antics, like setting fire to the house while we are asleep in the night, by carefully made equipment and standard methods of installation.

Regulations issued by the Fire Underwriters, known as the National Electric Code, are in part responsible for our safety. Inspection of the work by insurance inspectors, agents of the local electric power company,

[1] Adapted from "What Home Owners Should Know about Electric Systems," *Arts and Decoration*, June, 1930. Reprinted by courtesy of the *Arts and Decoration* magazine.

and sometimes city inspectors, has established a check on the work of the electric contractor that in general has protected our homes from ravages of fire caused by sparks of electric energy. Every home-owner should demand that the entire equipment, including service connections, wiring, fixtures, and electrical apparatus be inspected by a representative of the Bureau of Electricity of the National Board of Fire Underwriters, and that no current be turned on until a certificate from the Board has been turned over to him. In large cities the department of water supply, gas and electricity also issues a certificate of electrical inspection. The local electric power company usually sends around an inspector to check up on the wiring before the current is let into the house. Safe materials must be used by the electric contractor if he is required to conform to the National Electric Code. Of course any system of inspection can break down, if the inspectors are bought off, or are incompetent, but I do not believe that there are many verified instances where properly certified installations have been the cause of fires.

Trouble and fires usually start from installations made to existing systems by amateur electricians like the local hardware dealer's son or some handy man about the house who has purchased cheap and unapproved equipment. Of all the parts of the house, the electrical equipment should be tampered with the least by the home-owner. It is disturbing to see what liberties people will take with electric wires, when they want to secure a light in some remote corner of a room, where no convenient outlet has been provided. . . . .

For this reason, all new homes should be generously wired. An outlet in the middle of the room for a light or a few around the walls for side lights may be installed, but the most important ones are the wall outlets to which anything may be attached by merely inserting a plug. The finest method of lighting a home to-day is to have enough wall outlets so that portable lamps of different designs may be located at any point in the room without having to use electric wires more than six feet in length. The movable lamp, with its interesting base and artistic shade, is the only medium of home lighting that is flexible enough to allow shifting and changing until the best effects are obtained. People have discovered this to be true, and that is the reason why, when enough wall outlets are not installed, rooms are strung with wires.

Another type of outlet is very important to-day. It is called the power outlet. In many communities a lower rate is charged by the electric power company for current used to operate motors to run electric stokers and

oil burners, washing machines, electric ironers, electric refrigerators, sewing machines, vacuum cleaners, heaters, and the many other appliances that lessen the labor about the home and add to its comfort. Wisely have some of the influential executives of power companies said that the lower the rate can be made for the operation of such equipment, the more of these devices will be made and used, and the more current in the long run will be consumed by the public. Just at present though there is too much indifference on the part of some electric power companies to encourage the average home-owner in using power outlets in his home. Unless the home-owner is informed by the architect or builder, no effort will be put forth by the electric company to tell him to install two systems, one with a meter for electric lights and another system with a meter for power.

As it is true that a generous supply of light outlets should be located throughout the rooms of the house, so it is true that there should be plenty of power outlets. In general there ought to be one in the cellar to which the motor that operates the oil burner or electric stoker may be attached, one for the workshop bench in garage and cellar. In the kitchen there should be at least three, one for the refrigerator, another for an electric stove, and another for electrical food grinders and beaters. The laundry needs at least two; one for the washing machine and another for the iron and mangle. In the dining room and the breakfast alcove should be a power outlet for the operation of toasters, coffee percolator, table broilers, etc. In bathrooms a power outlet is useful for the operation of electric irons, curlers, massagers, water heaters, and similar devices. A general distribution of outlets through halls serves as additional source of power.

On an average the cost of each outlet for lights, including the wall outlets, switches, ceiling outlets, etc., is three dollars each. Power outlets usually run higher, being about four dollars each. For very little more, the wall outlets may be the duplex type; a type into which two wires can be plugged at once. This is worth while, since it provides additional places into which to plug lights. Flexibility of arrangement is the thing to plan for, and this improves conditions. After all, the good lighting of the home depends upon locating the lights in the proper place with reference to the furniture. As lighting is part of the decoration, and its success depends upon many things not possible to work out ahead of time, the wall plugs permit the shifting and adjustment of portable lamps to all parts of the room until the correct place is found for them. This cannot be figured out in advance in home decoration, and what is more, although a satisfactory

arrangement of furniture may be found and it may be satisfying for several years, the desire for a change may creep into the mind of the lady of the house, and a complete shifting of the furniture may be necessary after a while.

[NOTE.—*Progress in lighting:* According to an estimate made by the National Electric Light Association from records of electric-light companies 19,430,000, or 67 per cent, of the 28,808,000 houses were wired and received electric service in 1929. At the beginning of 1929 electric service was supplied to 7.2 per cent of the 6,315,050 farms. In a paper prepared by a committee of the American Home Economics Association for the World Power Conference, June, 1930, the following statement is made: "Every city in the United States of 5,000 population or above now has electric service; 97 per cent of all communities between 1,000 and 5,000; 50 per cent of all communities between 250 and 1,000; and more than 25 per cent of all hamlets of less than 250 population.]

SUMMARY

No hard and fast rules can be laid down as to what represents best practice in lighting the various rooms of a house; however, the following fundamentals should be observed: (1) Light should not be excessively brilliant or glaring. Extreme contrasts are objectionable. (2) Luminaires should be artistic and utilitarian in character. (3) Light should be toned to fit decorative schemes. The living room requirements: Medium intensity for general illumination with more brilliant light-sources for various points. The dining room: Good illumination on the table itself, soft but adequate illumination on the faces of the diners, a lower intensity of illumination through the remainder of the room. The kitchen: General illumination throughout with each work surface adequately lighted. The bedroom: A moderate intensity of general illumination throughout the room with higher intensity of local lighting at certain areas.

As lighting conditions that cause eyestrain depend somewhat upon the state of adaptation of the eye, it is difficult to define limits of these conditions. Excessive contrast, however, causes eyestrain. Usually when a room is considered overlighted the effect is merely glare from exposed light-sources. Unshaded light-sources should not be tolerated.

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CHAPTER VIII

HEATING, VENTILATION, AND HUMIDITY

1. Types of Heating Systems

THE HOME-HEATING SYSTEM[1]

By A. C. WILLARD

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. . . . It is amazing how completely the home-owners of this country regard the heating plant as something entirely separate and distinct from the house in which it is to be placed, and of which it is to become a part.

It is equally surprising to discover both from correspondence and personal interviews just what the home-owners mean by "best" type of heating systems. One owner is thinking largely in items of first cost, another of operating expense of which fuel is only a part, another of simplicity and "fool proofness," another of convenience, cleanliness, and automatic operation, another of more uniform temperatures from floor to ceiling and reasonable humidities.

And so it goes. We, on the receiving end for all these inquiries, feel like the man who was asked, "How long is a fence?" Only our problem is by no means as simple. Moreover, only a very inexperienced writer would attempt to say that there is one "best" type of heating system which fits all cases of home heating.

There are, however, certain facts that can be set down about home heating which will materially assist the home-owner in making an intelligent selection of a heating system for his home. These facts are based on the most outstanding results from the study of heating houses by various systems at the University of Illinois during the past 10 or 12 years. This study has been made in typical rooms subjected to severe winter weather conditions in a special laboratory (Fig. 46) as well as in an actual residence especially equipped for testing purposes. Here are the facts, in itemized form, although preference in the order of presentation has no particular significance.

1. *The house.*—The house structure itself should always receive con-

[1] Adapted from "The Home Heating System," *Successful Farming*, September, 1930.

sideration and be kept clearly in mind when deciding upon a heating system. A relatively small outlay on making suitable walls and window

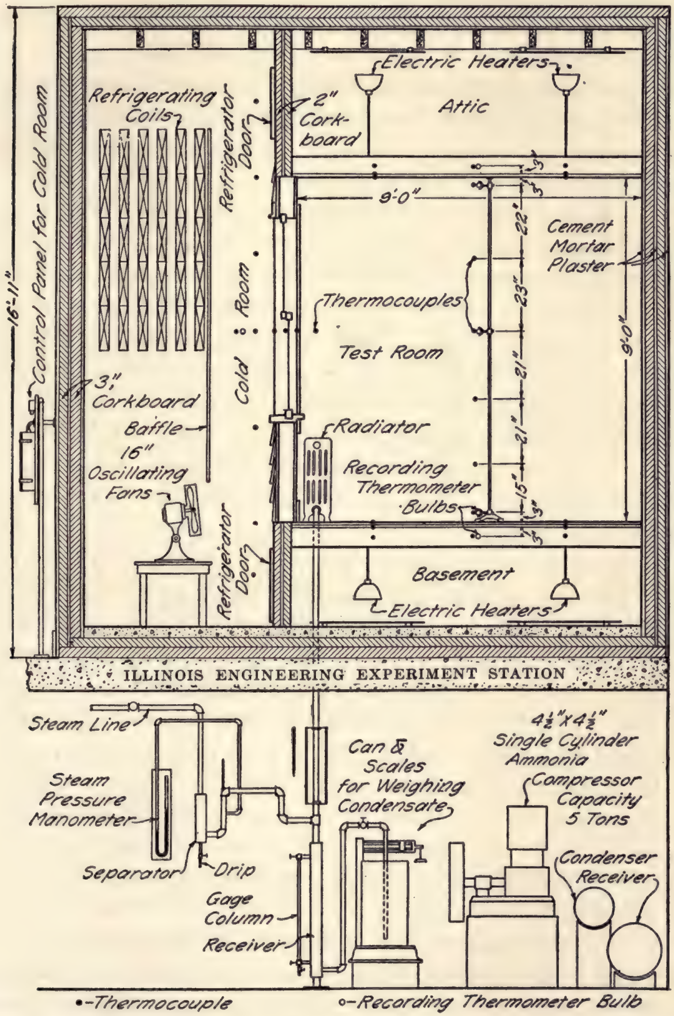

FIG. 46.—Elevation section of laboratory testing plant. Erected by the University of Illinois for the study of problems relating to direct steam and hot-water heating in co-operation with the Institute of Boiler and Radiator Manufacturers and the Illinois Master Plumbers Association. Note standard in center of test room for reading air temperatures between floor and ceiling.

frames tight[1] against the wind, and stopping all unnecessary air leakage into the studding spaces of the outside walls of frame houses or others of hollow wall construction will not only save fuel, but also add materially to the comfort of the occupants and may affect both size and type of heating system required.

A poorly constructed house which fails to keep out the wind cannot be heated or made comfortable by any heating system, but to achieve even partial success it will be necessary to have at least one direct heating unit, such as a radiator or stove, in every room.

2. *The chimney.*—Since it is impossible to burn any fuel without a positive air supply under proper control, it is necessary to have a chimney. The chimney, by virtue of the draft which it creates, provides this air supply. The chimney draft is caused by the vertical column of gas.

Since in any given house the chimney height is fixed, anything which reduces the temperature of the flue gas reduces the draft. The chimney must be straight and true, of full uniform size from top to bottom, with no leaky joints and with no other openings either above or below the smoke opening for the heating plant. Chimneys for domestic heating plants should preferably pass up through the house and not be run as part of exposed outside walls.

3. *Direct and indirect systems.*—There are two general types of heating systems in use today, known as the direct and the indirect. The former (Fig. 46) includes ordinary stoves and the more modern and familiar direct steam and hot water radiators located right in the room to be heated. Such systems not only warm up the air in the room, but also give off more or less heat by radiation to the walls, the furniture, and the occupants.

The latter or indirect system (Fig. 47) has no heating surfaces in the room, but instead supplies heated air through one or more registers. This air mixes with and warms the air in the room to the desired temperature. Furnaces placed in the basement, both of the "pipeless" and the more satisfactory piped type, as well as "indirect" steam and hot-water radiators are used in such systems.

Fans are not necessary in any of these indirect systems in the average home, but may be used if the owner desires to accelerate the air flow over the indirect heating surfaces. When fans are used, somewhat lower heated air temperatures are sufficient, since more air is sent into the rooms which

[1] This does not refer to the use of thermal insulation or the use of weather-strips, valuable as they may be when properly and intelligently applied, but merely to the equivalent of good first-class construction.

are to be warmed than would be the case with a gravity flow system. There is no radiation effect in the actual rooms of the house when indirect systems are used, and some people require a slightly higher air temperature where there are no direct heating surfaces.

4. *Floor and ceiling temperatures.*—Any of the systems indicated in the preceding sections is capable of heating a house to 70 degrees Fahrenheit at the "breathing line" (an arbitrary level five feet above the floor), at

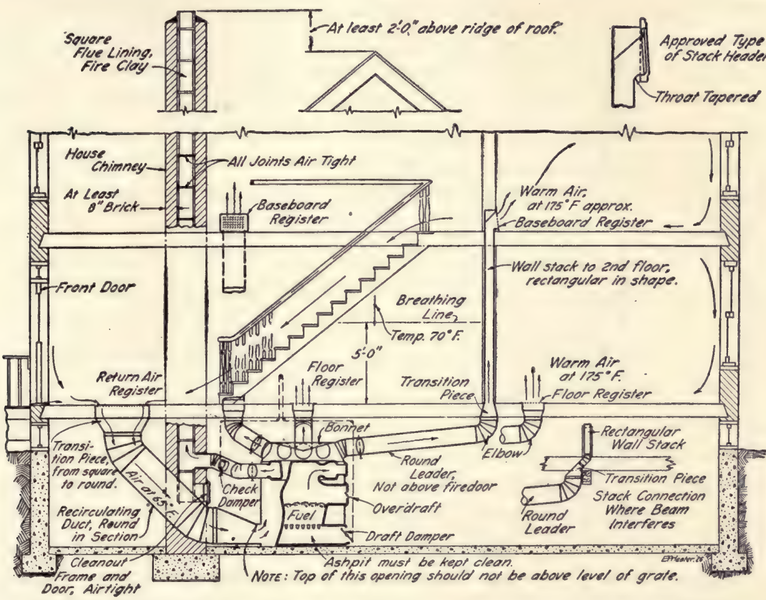

FIG. 47.—Section of elevation of a house, showing installation details for warm-air heating system. Note location of the return air register and tapered transition fittings to reduce friction of air flow.

which level temperatures are always taken in checking up a heating guarantee. There may, however, be a great difference between the "breathing line" temperature and the air temperature at other levels in the room. Tests at the University of Illinois, in actual rooms, when it was zero outside and 70 degrees at the breathing line showed temperatures as low as 60 degrees near the floor and 85 degrees near the ceiling. Even worse conditions at floor and ceiling may exist with stoves and "pipeless" furnaces, although the "breathing" line temperature is maintained at 70 degrees in all cases.

Modern warm-air furnace heating systems (Fig. 48), and "indirect" steam and hot-water systems, as well as direct steam and hot-water systems (see note, Fig. 48) using long, low, narrow radiators, will maintain much better air temperatures at floor and ceiling than those quoted at 60 and 85 degrees, respectively.

Such extreme conditions are intolerable and the home-owner will avoid much dissatisfaction and argument, as well as much personal discomfort

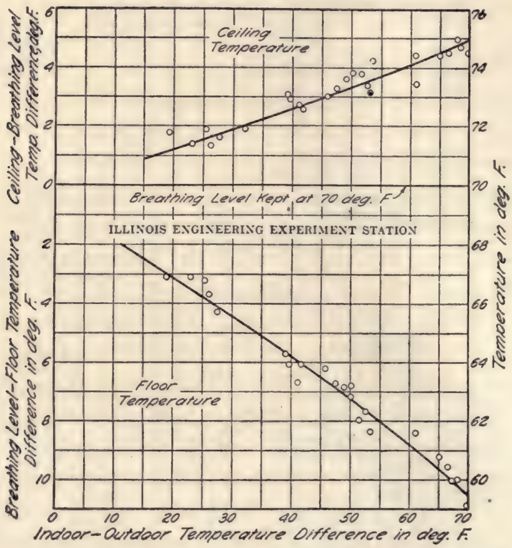

FIG. 48.—Curves of floor, breathing level, and ceiling temperatures for living-room from research residence. Note air temperature difference between ceiling and floor increases rapidly as indoor–out-of-door temperature difference increases. Direct steam and hot-water systems with long, low narrow radiators under windows may be operated with smaller air temperature differences between ceiling and floor than shown in the chart.

by giving thoughtful consideration to the effect of type of heating system and heating units in the rooms on the room air temperatures at floor and ceiling, regardless of the fact that the system may maintain a "breathing line" air temperature of 70 degrees. Here are the basic principles:

a) For indirect systems, the air supplied to the rooms for heating should enter at a relatively low temperature even in coldest weather. When it is zero outside, this temperature should never be above 175 degrees at any register face, and better be 150 degrees. The air supply from "pipeless" furnaces is usually heated far above these temperatures.

b) For direct systems, the heating surface should not be highly heated as is often the case with stoves. Even with direct steam radiators which are usually somewhat above 212 degrees, much better results will be secured with long, low, narrow radiators than with high radiators. Hot-water radiators are seldom operated at water temperatures above 170 degrees with an open tank system, and maintain better room air temperatures at floor and ceiling than steam systems using radiators of the same type. With pressure systems of hot-water heating water temperatures may run to 220 degrees.

Experience has shown that the cheaper the heating system, the greater the air temperature difference between floor and ceiling. . . . .

5. *Regulation, control, and flexibility.*—The effect of type of heating system on regulation and control of air temperatures throughout the house, as well as on the flexibility and responsiveness of the system, is often given too little consideration. Certain systems may be controlled from a central point, such as the main heating unit, far better than others. Stoves, of course, which are individual units in themselves and must be dealt with separately, are hardly to be considered in this connection.

Unless a direct steam heating system is specially equipped, as with vacuum air valves at each radiator, and the entire system is made air tight, it will not be possible to regulate the temperature of the steam and control house temperatures from the main unit. The ordinary steam system is "all on" or "all off," and it will generally overheat in mild weather, unless especially equipped with manual or automatic regulation of the drafts to actually operate under vacuum conditions. Hence, the ordinary direct steam heating system has little flexibility.

A direct hot-water heating system, on the other hand, as well as an indirect warm-air heating system, is extremely flexible and the house temperature may be controlled from the main unit by manual or automatic regulation of the drafts. In mild weather, very low water or air temperatures may be maintained, and in severe weather very much higher water or air temperatures corresponding to the weather conditions may be maintained. So long as there is any fire in the main unit there is heat in the hot water radiators, or in the air entering at the registers. The warm-air furnace system is the most responsive of all systems, as a change in fire intensity in the main unit is immediately reflected in the temperature of the air passing through the system.

6. *Operation and maintenance.*—With hand-fired systems using solid fuels, there is not much difference in the attendance required in operation

where a single central heating unit is installed in the home. Stoves, of course, require much more attendance depending upon the number installed and in operation.

Mechanical coal stokers, which are now available and quite successful, will materially reduce the amount of attendance required for any type of heating system. Oil burning and gas burning equipment still further reduces the amount of attendance, but the latter can only be considered where a gas service is available. Special attention is directed to the fact that when mechanical stokers, oil burners, and gas-fired equipment are once installed, the operation of an entire system is *dependent on the reliability of the electric service* usually essential in all such systems.

The maintenance of any heating system depends largely on the care and attention given to the system and varies through wide limits. No system is absolutely foolproof, but a warm-air furnace system is practically immune against freezing which, of course, is not true of steam and hot-water systems. The fuel burning unit of any heating plant may be ruined in a comparatively short time by careless firing and indifferent control of drafts.

An exactly similar unit and type of heating system may last a lifetime if carefully fired and properly regulated, so that the fire is never allowed to "run away" with drafts left wide open. Uniformity of operation, meaning a fairly constant house temperature day and night, means long life for the main unit, and more comfort for the occupants, and generally requires less fuel.

Throwing the drafts wide open and then allowing the plant to "run wild" every morning is about as perfect an illustration of "what *not* to do" with a heating plant as could possibly be found.

7. *Installation and operation costs.*—Selecting the type of heating system on the basis of installation cost alone may result in disappointment. In general direct hot-water systems cost more to install than indirect warm-air furnace heating systems with direct steam systems somewhere in between. The range in cost of materials and labor for any one of the three systems is probably greater than the difference between the cost of any two successive systems listed above.

The range in cost just referred to has no reference to quality of materials and labor, but to the differences in design and installation details which may exist with any one type of system. The "best" of any one type of system, including all automatic devices for regulation and control, may cost much more than the "poorest" of some other type of system with no automatic devices for regulation and control.

Operating costs do not vary greatly in the same house between the three systems, provided the same fuel is used and the same degree of automatic or manual control is provided, and we have a well-designed plant in each case. Small differences in the overall efficiency of the heating plant as a whole are of no great consequence since the only heat really lost from the house is that left in the smoke gases at the top of the chimney, assuming an inside chimney. Of course, if there is much difference in the completeness with which a given fuel is burned, the efficiency of the main unit becomes important.

In conclusion, it seems hardly necessary to add that the selection of the "best" type of heating is not a simple matter, but depends on many factors, the relative importance of which varies with the individual home-owner, his house, and its location.

PROGRESS IN HEATING[1]

By A. S. ARMAGNAC
Editor, *Heating and Ventilating Magazine*

As late as 1926 a review of the heating industry for the previous fifty years, published in a prominent American architectural journal, had not one word to say about tubular radiation, light-weight brass and copper radiators, viscous-fluid air filters or present-day methods of concealing radiators and humidifying the home. All of these advances have come with astonishing rapidity.

To get a clear idea of the development of the industry it should be stated that the progress since the World War, both in the design and application of heating appliances, outweighs that of the entire previous period.

Warm-air furnace heating, as we know, held the field for many years before steam or water heating was even thought of. But the success of radiator heat in some of the larger buildings in the centers of population soon began to stir the imagination of the more affluent home-owners and in the late '70's we begin to hear of occasional installations of steam and water heating systems in homes.

For years steam and hot water ran neck and neck in popular favor. As better methods of steam heating were adopted the hot-water people, not to be outdone, developed methods for accelerating the flow of the water and thereby secured an added efficiency for water heating which has

[1] Adapted from "Heating Steps Forward," *American Builder and Building Age* (formerly *Building Age*), April, 1929.

enabled this method to hold its own in the face of the growing competition of vapor heating. To-day vapor steam heating has gained such favor as to be accepted as standard in many sections of the country.

In radiator-heated houses one seldom sees a radiator on an inside wall and yet from the earliest days to the present time warm-air furnace systems have continued to be installed with registers so located as to preclude any possibility of satisfactory heating. Since the advent of the auxiliary warm-air furnace fan, installed in the furnace casing at the cold-air inlet, there has opened a brand new field of usefulness for the warm-air furnace. With the increased air pressure supplied by the fan it now is possible to locate the registers in their proper places near the outside walls and thus counteract the cold-air currents before, rather than after, they enter the room.

Perhaps the most significant feature of the advance in heating methods and, perhaps, the underlying cause of the new era, is the realization that a house-heating system can be made one of the home's most attractive features, instead of a necessary evil in the economy of life. No doubt this is due in part to the advent of the oil burner, but not entirely. Much of the credit for the improved status of radiator heating belongs to the light-weight heating surface of copper and brass and their alloys which has made it possible to conceal the radiation, within narrow limits. For the first time we saw heating surface, only a fraction of the size of cast-iron radiators, concealed in partitions and in outside walls in such a way as to provide fully as much heat as the larger units.

It is not too much to say that the new arrangement made possible by concealed radiation transformed the whole picture of home heating. It lent itself so readily to architectural treatment that the design of the heating system has come to rank second only to the design of the house itself. In places where exposed radiation is still necessary we have the graceful tubular radiator at our disposal.

More recently there has come the development of still another type of radiator designed to throw more heat out into the room and less toward the ceiling, thereby securing equal effect where heat is most needed, while actually condensing less steam. This heating surface is set flush with the wall and secures its effect largely through its radiant heat. Its advocates speak of it as the herald of the "era of useful heat."

When the oil burner reached its present state of development and the gas burner, as well as the gas-fired boiler, established their places in the house-heating field, they not only helped to usher in the era of heating

comfort, but they did an unexpected thing in freeing the basement from its lowly place as a storeroom for coal and the endless array of household impedimenta. Thereafter, the basement was able to assume a new rôle as a playroom for the children or a billiard or a lounge room for the older members of the family.

While methods of heat regulation were fairly well known to the industry before domestic oil burners became so popular, it is a fact that the rise of such devices in systems using both oil and gas for fuel led the way to the wide adoption of thermostatic control and other devices in the home.

[NOTE.—Several makes of automatic stokers are on the market. Usually the fuel which is placed in a hopper is carried to the under side of the grate by a conveyer where it is pushed up through the center. The conveyer usually operates by an electric motor. A draft is provided by a blower. The burning of the fuel starts from the top and goes downward.]

THE PANEL HEATING SYSTEM[1]

BY HOWARD T. FISHER

There has recently been developed in England, and now first introduced into this country in the British Embassy in Washington, a new type of patented heating system consisting of concealed hot-water pipes placed in the ceiling.[2] While originally developed as the result of a desire to eliminate exposed radiators and grills it was subsequently discovered that radically new heating principles were involved offering decided advantages.

Principle of operation.—The basic arrangement is in all essentials similar to a regular hot water heating system except that, instead of exposed or concealed radiators, coils with welded joints and tested under high pressure are placed in the ceiling just above its lower surface and buried in the plaster, which is of a special type to prevent cracking. Hot water is circulated at a relatively low temperature either by gravity or by pump. By means of these coils the plaster is raised in temperature to a point where the heat radiated from its lower surface is sufficient to warm the room to the desired point. However, as the air cannot be warmed by convection, owing to the location of the source of heat at the top of the room, and as radiant heat does not appreciably warm the air through which it

[1] Adapted from "The Country House," *Architectural Record*, November, 1930.

[2] Richard Crittall & Co., Ltd., of London, control the patents; Wolff & Munier, Inc., 222 East 41st Street, New York, are American agents.

passes, the air in the room is left at a relatively low temperature. The comfort of the occupants does not depend primarily on the warmth of the air but on the heat radiated by the ceiling, in the same way that a person sitting in a protected sunny spot on a cold winter day may be adequately warmed by the radiant heat of the sun although the air may be very cold. The inventors claim that a room heated by the panel system will be entirely comfortable with the air at a temperature of only 62°, and further that with the air heated above that point a sensation of serious overheating will be experienced.[1] The recent work of the New York State Commission on Ventilation has shown the dangers to health of overheating, and the importance of a matter of even two or three degrees. This commission recommends that the air temperature be maintained as low as is consistent with comfort, and panel heating may provide a means for comfort at a temperature far below that possible with any other system of heating.

At the present time, however, the development of the system is still in its infancy and there are many questions yet to be answered. For example, just how is such radiant heat to be thermostatically controlled, and how is the temperature of the air to be properly correlated with the amount of radiant heat? How is a desirable air motion to be procured when there are no convection currents?

RADIATORS[2]

By P. E. FANSLER
President, Heating Journals, Inc.

In the heating system employing water, steam or vapor as a heating medium, the boiler performs two functions—it contains the combustion chamber, wherein the fuel is combusted, and its other function is the transfer of the heat produced by combustion to the heating medium. The piping conveys the heated medium to the radiators and their job is to transfer heat from the medium to the air in the rooms.

In one sense the efficiency of a radiator may be 100 per cent, although, obviously, it does not transfer all of the heat from the water or steam to the air, the thought being that *all* of the heat lost by the steam or water is transferred to the air in the room. However, the *effectiveness* of the radiator may be very far from 100 per cent, and this is a matter of major concern to the home-owner. By effectiveness we mean the degree to which

[1] The humidity conditions accompanying these temperatures are not given in their statement.

[2] Adapted from "Heating the Small Home," *Small Home*, April, 1930.

the heat transferred by the radiator becomes useful to the dwellers in the home. You can see that if all of the heat taken from the radiator were used to heat the stratum of air within a foot of the ceiling we would have a sad state of affairs, for with no mechanical forces available, we would have an excessively hot ceiling and, perhaps, a floor-line temperature far too low for human comfort.

We might, therefore, define the effectiveness of a radiator as its ability, first, to transfer heat to the air of the room at or near the floor line and, second, to offset the effect of infiltrating cold air which enters, in largest quantity, around the window frames.

It is remarkable how poorly and ineffectively the average home is heated, and how large a factor is the improper selection and placement of radiators. In planning radiation for a home, it usually is assumed that each room is an isolated unit, and is considered without reference to other rooms except that they contribute warm walls and other dividing partitions. If we have a radiator in such a room, it heats the air that touches its surfaces, and this air thereby being rendered lighter per unit of volume, will rise *if* there is an equal volume of colder air that can flow down and replace it. As the coldest and densest air is along the floor line, theoretically there will be set up a circulation around through the room. In practice, however, we usually find a "close" circuit being set up, the tendency being for the air close to the floor to move very slowly to the radiator, the principal and more active circulation being largely above the line of the radiator top. Thus we have a definite and quite strong stream of heated air rising above the radiator, diffusing and spreading to cover the entire area of the room at the ceiling, and much higher temperatures and rate of air movement than at the floor line.

Under these conditions it is difficult to imagine a heated volume much below the mid-line of the radiator, and if this is one of the high type, the inadequately heated lower portion of the room easily may be 3 ft. high. Putting it the other way, it is quite obvious that the most effective radiator is that which delivers its heat at the lowest level; i.e., the lowest radiator of any given capacity. As a general thing, I would recommend a long, low radiator under each window of a room rather than a large single (and usually high) radiator under the largest window. There will be a much better distribution of heat throughout the room, especially in the zone occupied by the occupants—that is, the portion from the floor to about the four-foot line (as it is more common for people to sit than to stand).

Thus far we have been discussing radiator performance based on the

air that is heated through transfer of heat from the steam or water, through the iron of the radiator to the air that scrubs along the surfaces of the radiator; in other words, to the heat transfer by convection. But we cannot disregard the fact that a radiator actually *radiates* heat to no small degree. Many people think of radiant energy as being emitted only from a surface that is so hot that it may be said to be radiant—that is, at least "red hot." If you pick up a white-hot coal from the fire and hold it in a pair of tongs, you readily appreciate the fact that it is giving off energy in a radiant form. This emission is at a tremendous rate, at first, because the temperature of the white-hot surface is so far above the temperature of any surface that can be "seen" from the piece of coal. This energy travels from the surface of the piece of coal just as the light waves travel from its surface. And, as the coal slowly changes color, first to bright, and then to dull red, the rate of radiant emission decreases. Then comes a time when you can see no sign of luminosity—the coal is jet black. But, if you were to touch it with your fingers an ugly burn would result. Yes, radiant energy still is being given off—at a lower rate, to be sure—and it does not cease until the coal has become as cold as the objects surrounding it. If it could be maintained, say by an internal source of heat, at 180°, it would continue what we might call "low-temperature radiation" just as long as heat was supplied. And it would act just as a radiator filled with water at 180° does. However, the ordinary garden variety of radiator consists of many "sections" with curved surfaces, and as the emission always is at right angles to the surface, you can see that the radiator will "radiate" heat—at a comparatively low rate—into almost every nook and cranny of the room. So we must take account of this radiating ability.

First, we must look at the other end—the reception end—of the radiation phenomenon. If the radiator *emits* radiant energy, where does this energy go to? It is absorbed, or reflected, or both, by every substance upon which it strikes. If the object is a dull black almost all of the energy that strikes its surface will be absorbed, and this heat absorption raises the temperature of the object. If the object is a glossy white—enamel, for instance—by far the greater part of this radiant energy will be reflected, just as light is reflected by a mirror, and so it will pass into space until some other body gets in the way.

So the radiant energy waves from the (comparatively) low-temperature radiator travel out into the room, striking the furniture and the walls, and the human beings in the room, and warming them all. Now, it is a curious fact that the human being, just like the cat, prefers its heat in the radiant

form. Watch a man stand in front of a fireplace and turn himself about, enjoying the sensation of receiving (comparatively) high-temperature radiation from the flame. (Of course, I am not considering radiant energy of a higher order than usually is available in the home.)

Now, as we put radiators in a room mainly for the purpose of making its occupants comfortable it certainly would seem sensible to deliver the requisite amount of heat to the room—and to them—in the form that will give them the greatest comfort. Consequently, research having determined these facts, radiators now are being designed to radiate heat more *effectively* into the zone of occupation of the room. . . . .

Because we are gaining a more comprehensive idea of these things, radiator design is undergoing a rapid change, and the radiator of the near future will not only heat the air of the room, by convection, at a lower level, but will diffuse its radiant heat emission only through the lower zone. That will mean, in the latter instance, larger surfaces facing the room, occupying, possibly, all of the wall surfaces below all of the windows, instead of being concentrated in a single unit with little surface "facing" the room.

The English have done considerable research in this problem, and have developed both "panel" and "ceiling" heating. The latter is the "panel" system applied to the ceiling instead of the wall. The "panel" system utilizes comparatively large metal panels or containers of water or steam, embedded in the walls, usually occupying spaces that are not useful for other purposes, but effective as areas from which to emit radiant energy.

I may be too visionary to be practical, but I would carry these ideas to the extreme and resort to low-temperature heating of the largest possible area at the lowest possible level—and what would answer this purpose better than the floor of the room? Make the floor of tile, or similar substance, and heat *it* in any one of a number of possible ways, to a temperature of 80° to 85° (which English research has shown to be the maximum temperature that will be comfortable to the feet). Then heat will be transferred to the air at the lowest possible level by convection, and the zone between the floor and the four-foot line will be the warmest and most comfortable to the human body. What a contrast in human comfort is evidenced in the person standing on a floor at 85°, with a temperature of 70° at the kneeline, 68° at the breathing line, and the individual with his feet on a 55° floor, his knees in a temperature of 60° and his head bathed in 75° air.

There are several distinct tendencies in American practice today, not

all of them of interest to the owner of a small home. First, the trend toward radiator covers or grilles. This is a practice that may lead to troubles for, if the application is not carefully done, the result may be detrimental. It would require too much space to go into details; suffice it to say that covers or shelves set down close to the top of the radiator, or of complete metal enclosures with screen-covered openings at top and bottom, or of enclosures in window recesses may reduce the heat-transmission efficiency as much as 40 per cent. So you will see that this subject should be referred to the heating engineer or to the well-informed heating contractor.

Again, there has come the development of radiators designed to be placed behind the wall line, with grilles top and bottom. Obviously, this treatment of a radiator places it in the category of those just described. To overcome the reduced heat transmission, which is due to the fact that the air-flow over the radiator surfaces is retarded by the screening and reduced areas of the air channels, a very small electric motor and fan can be used, and radiators with this equipment built integral are available. While this class of equipment is expensive, largely on account of the restricted market, there is no reason why the owner of a small home cannot have it, at least in the living and dining rooms, and thus get rid of the usually unsightly radiator.

Then, there is the radiator designed for increased radiant effect, usually installed below the windows and with its outer surface forming the wall line. And we must not forget the new radiators made of metals other than iron or steel—the copper and brass units, with fins, or plates, or, perhaps, tubes, like the automobile radiator. These are coming more and more into use, as they can be used in front of or behind the wall line, and in either case have a given transmission effect with a minimum of volume.

Above all things, make sure that radiators are ample in size to liberate heat at the desired rate, as it is a simple thing to reduce emission by slightly closing the valve. It is impossible, however, to get the desired heating effect from an undersize radiator except by raising the temperature of the water or steam, and often this is difficult, if not impossible.

Here, again, it pays to have a competent heating contractor, as he will intelligently locate and size the radiators while a lower bidder and less competent man may skimp on sizes and locate radiators where they can be piped with the least amount of materials, regardless of the fact that they will not show the same degree of effectiveness.

THE PAINTING OF STEAM AND HOT-WATER RADIATORS[1]

For a number of years this subject has received considerable attention from the public, and it is apparent that the essential facts have not always been understood. The object of this note is to supply the more important facts in the case.

We will state at the outset the principal conclusion, which will be explained in more detail later, that repainting a radiator may, *under otherwise identical conditions*, cause it to transfer either more or less heat into the room than before, so that the effect of repainting would be the same as of putting in a different radiator, either larger or smaller as the case may be.

The purpose of a heating system is to maintain the rooms in a house at some temperature higher than that prevailing out-of-doors. The heat which is developed by burning fuel is transferred to the rooms by means of the radiators. A radiator neither creates nor destroys heat, and a large radiator, while it can put more heat into a room than a small one, must be supplied with all of the heat it puts in. In the sense that they ultimately transfer all the heat supplied into the room, all radiators are 100 per cent efficient. The word "efficiency" is, however, used in other ways, and it is now customary to use it on all possible occasions, but it is hardly correct to say that putting metallic paint on a radiator reduces its efficiency when the effect is merely to reduce its capacity. The size of the radiators in a house is only remotely connected with the amount of fuel required for heating, and unless the radiators were so small as to make the whole heating plant ineffective, no noticeable saving of fuel would be expected to result from installing larger radiators.

It will appear that as far as their effect on the performance of radiators is concerned, paints fall into two classes; first, those in which the pigment consists of small flakes of metal, such as the aluminum and bronze paints, most commonly used for painting radiators, which produce a metallic appearance and will be called metallic paints; second, the white and colored paints, in which the pigment consists, not of the metals but of oxides or other compounds of the metals. Thus white lead paints, or those containing compounds of zinc or other metals, will be called non-metallic paints. These non-metallic paints are obtainable in practically all colors, including white and black, while the metallic paints have the color of the metal or alloy of which the flakes are composed.

After these preliminary explanations, we may proceed to consider

[1] U.S. Bureau of Standards, Letter Circ. 263, 1929.

what kind of effects may be obtained by the use of various kinds of paint. The heat emitted from a radiator is removed in two ways: First, the air streaming past the radiator and rising from it is heated, and carries the heat to other parts of the room; second, the hot surface of the radiator emits heat by radiation just as the glowing electric and gas heaters do. Most types of steam and hot-water "radiators" emit less than half their heat by radiation, and evidently the name "radiator" although universally used, is not a particularly appropriate one.

To take a concrete case, a particular sectional cast iron radiator if painted with any non-metallic paint might transfer into the room, 180 Btu per hour for each square foot of its surface, if supplied with the necessary amount of heat from a boiler. (A British Thermal Unit or Btu is the amount of heat required to raise the temperature of one pound of water by 1° F.) The burning of one pound of good coal produces about 12,000 Btu and if the coal is used in a domestic heating plant, perhaps half of this, or 6,000 Btu, might finally be transferred from the radiators into the rooms. Most of the other half of the heat produced is inevitably lost via the chimney.

The area of one section of a cast iron radiator is about 2 sq. ft. for the smaller sections and up to 7 or 8 sq. ft. for the larger sections so that a 10 section radiator would have a surface area between 20 and 80 sq. ft.

Of the 180 Btu per hour transferred, about $\frac{2}{3}$ or 120 Btu would go to heating the air which passes over the radiator. The 120 Btu transferred directly to the air would not be increased or decreased by repainting the radiator. The remaining 60 Btu not carried off by the air is emitted as radiant energy. The amount of radiant energy which can be emitted per hour by the hot surface is dependent upon the kind of paint used for the last coat. It was assumed that the radiator was painted with non-metallic paint. If it be repainted with a metallic paint, such as aluminum or bronze, it will no longer be able to radiate 60 Btu per hour, but may be able to radiate only 30 Btu, so that instead of transferring 180 Btu to the room per hour, it can now transfer only 150 Btu. The coat of aluminum or bronze paint is not an insulating covering like a covering of magnesia or asbestos, but it has a similar effect, although for an entirely different reason. The resulting reduction in heat emission is entirely due to the reduction in the radiating power of the exposed surface, rather than to the insignificant insulating value of the thin layer of paint. It is therefore evident that undercoats of paint, regardless of kind, have no significant effect on the performance of the radiator, except in the practically im-

possible case where the paint was thick enough to act as an insulating covering. In repainting a radiator, it is therefore unnecessary to remove the old paint. The effect of adding the metallic paint is equivalent to removing $\frac{1}{6}$ of the radiator, or nearly 17 per cent, or as if one section out of six had been removed. Thus a radiator of five sections painted with white or colored paint should be about as effective as another of six sections of the same kind, painted with metallic paint, since each would transfer the same amount of heat to the room, provided the necessary amount of heat were supplied to each.

In the following applications, the numerical values given above will be used as if they were exact, but it must be understood that they are merely representative and would not apply exactly to any particular case except by chance. The effect of painting on the capacity of a radiator depends upon the size and design of the radiator. The reduction in capacity produced by the application of aluminum paint is less for large radiators than for small ones, especially so in the case of large radiators having many columns or tubes per section. In a large tubular type radiator having 7 tubes per section, more than $\frac{3}{4}$ of the heat is carried away by the air directly, and painting with aluminum consequently reduces the capacity of the radiator only about 10 per cent. If only the visible portions of a radiator are painted with aluminum paint, the reduction in capacity is also obviously less than if the entire surface is covered.

Application 1.—Suppose a house in which all the radiators are painted with aluminum paint, and that the radiator in one room is found to be too small, so that when the other rooms are warm enough, this one is too cold. If the radiator in this room is repainted with non-metallic paint either white or colored, the heat emitted by it can be increased from 10 to 20 per cent without affecting conditions in the other rooms, although it will be necessary to burn more fuel to supply the additional heat in the one room. If the increase is sufficient the expense of installing a larger radiator may thus be avoided.

Similarly, it is possible, by using bronze or aluminum paint on radiators in rooms which are overheated, and colored or white paints in rooms not sufficiently heated, to improve conditions without going to the expense of installing new radiators of larger or smaller sizes.

Application 2.—In installing radiators in a new house, somewhat smaller radiators may be installed if they are to be painted with colored paints, rather than bronze or aluminum paints.

Application 3.—If the radiators on a hot-water system are painted with

metallic paint, and are all too small, so that the water must be kept hotter than is desired in order to heat the house, they may be repainted with non-metallic paint, and it should then be possible to heat the house with the water in the system not quite so hot. There will be no noticeable saving of fuel.

Application 4.—Since basements are usually overheated so that much of the heat supplied there is wasted, some economy can be affected by painting the heater and pipes with metallic paint. This can not, however, serve as anything more than a poor substitute for a covering of good insulating material, about an inch thick, which is capable of making an appreciable saving in the coal bill. The insulating material will remain effective for years, while the paint becomes ineffective if covered with dust.

Application 5.—If a radiator is situated next to an outside wall, as most of them are, it is evident that the heat supplied directly to this wall is more or less wasted. Some slight economy may be obtained, therefore, by using metallic paint on the side facing the wall and non-metallic paint on the visible portions. The gain is not large enough to be important, but on the other hand, in putting non-metallic paint over metallic, it is not worth while to go to the trouble of repainting the side next the wall.

Results of emissive tests of paints for decreasing or increasing heat radiation from surfaces, and a discussion of various applications of the results found, are given in Bureau of Standards Technologic Paper No. 254, which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C.

AUXILIARY HEATING BY ELECTRICITY[1]

By ROLLIN C. CHAPIN
Architect

The problem of maintaining warmth and comfort in the home on the cool days before and after the regular heating season is a troublesome one to many home-owners. How often, at such times, is one cold enough to feel uncomfortable, and yet prefers to remain thus rather than go to the bother of starting a furnace fire! Oil burners and gas-fired heating plants have simplified matters as far as elimination of dust and drudgery is concerned, but there are times perhaps when heat is needed in only one or two rooms, in which case the operation of the entire heating system is neither economical nor desirable.

[1] Adapted from "Heating by Electricity," *Small Home*, May, 1930.

The solution is auxiliary heating by electricity. There are now on the market electric heaters of many types, adapted to meet the requirements of every condition. They may be briefly classified as built-in wall heaters, portable heaters and electric fireplace heaters. The heating unit is either of the convection type or the radiant type. The former is the better adapted for heating rooms to a uniform temperature throughout. It imparts heat to the air and causes the air to circulate throughout the occupied space. This heat is of comparatively low intensity and does not injure objects in the room nor cause discomfort to the occupants. The radiant type radiates heat but does not cause the air to circulate. Like the sun's rays, radiant heat warms only when it comes in contact with objects in front of it. It is therefore suitable for a fireplace and for portable or built-in heaters where intense heat close to the heater only is desired. There are heaters which can produce either circulating or radiant heat, so that either or both may be used.

The heater best adapted for general room heating is the built-in or wall type. In houses to be constructed they may be easily installed if they are planned for in advance and provision in the electric wiring is made for outlets at the proper points. Each heater should be placed on a separate circuit. Since they are set into the wall, they take up no space in the room. The heating unit is covered by a metal grille or register face of neat design, which may be finished to harmonize with walls or woodwork. The snap of the switches on the face of the grille turns on the heat instantly. The heat may be regulated by turning on one or more of the heating units. . . . .

If the house is already built, and wall heaters cannot be easily installed, portable heaters are the ones to use. They are made in various sizes and in many pleasing designs. Made usually of cast iron, or steel, finished in colors harmonizing with the woodwork of the room, portable heaters take their place creditably in the best-furnished rooms. They may be easily placed in any part of the room or carried from room to room. Connection must of course be made to wiring outlets. For the larger heaters, special heavy duty receptacles and plugs are necessary.

Then there are the electric fireplace heaters. Whatever the heating system, the open fireplace will ever maintain its place in the home, both for its cheer and its decorative value. Probably to many the thought of an open hearth without a genuine blazing log would never be tolerated. Nevertheless, the fireplace heater is becoming a worthy substitute, and it finds favor with many who desire the warmth and glow of the fireplace

without the dirt and work involved in a wood or coal fire. Moreover, no flue is required, and thus no heat is lost through the chimney flue. Fireplace heaters may be had in several good designs. They are of cast iron finished with cast bronze ornaments and hearth plate. For a Colonial or Adam mantelpiece, there are Georgian and Adam designs which are admirable. The radiant type of heat unit is usually employed, for this gives a glowing warmth resembling that of a burning log. As on other heaters, the heat may be regulated. A heavy duty receptacle such as that required for an electric range is necessary.

A step further toward the reproduction by electricity of an actual wood log fire, is the electric fireplace log. The log, of cast iron is an almost exact imitation of an old oak log, with bark, knots, moss and even axe-cuts reproduced. A heating element mounted under the log in an inconspicuous position furnishes ample heat. Mechanical fans revolve when the current is turned on giving the appearance of darting tongues of flame. Lights and heating units are operated by a dual-control switch. To make the illusion complete, an artificial ash slab is provided, giving the effect of ashes dropping from the burning log. Still another design closely imitates a coal fire by the same method employed in the electric log. In both the log and coal types, andirons of attractive design are provided.

In localities having no gas or where the gas rate is unusually high, electric water heaters meet the need. Their convenience and cleanliness and the absence of any care such as is necessary with gas, coal or oil make them highly desirable. They are of the automatic tank storage heater type, and may be had in sizes which will give any desired amount of hot water. With full automatic control, which is a thermostatic device, no attention whatever is required, and thus no heat is lost. . . . . A less expensive type is the manually controlled, which is turned on and off by a switch located at any point in the house. A third type is the semi-automatic. It consists of a clock control which can be set for any desired quantity of water. The clock winds itself and shuts off the water automatically.

For auxiliary heating, electrical heat is clean, safe, easy to control, practically instantaneous, healthful and efficient. The cost of installation is not high compared with other methods of heating, and the operating cost consists of electric current only, repairs being rarely needed. For homes in localities having mild winters electrical heat may well be depended upon entirely, but in the colder climates it is not as yet feasible

as a principal source of heat. The rapid progress being made in the development of electrical devices of every kind, however, promises the constantly increasing use of electricity for heating purposes.

2. Air Temperature, Ventilation, and Relative Humidity

WHAT IS A COMFORTABLE TEMPERATURE?

The American Society of Heating and Ventilating Engineers, the Public Health Service, and the United States Bureau of Mines have coöperated in making intensive investigations to determine the kind of atmosphere best for human beings. Mr. P. E. Fansler in his article "The Problem Faced by the Small Home Owner" in the series "Heating the Small Home"[1] discusses the results of this investigation. He states:

. . . . That particular effective temperature at which a maximum number of people feel comfortable is called the "comfort line." While at rest, 97 per cent of people have been found to be comfortable at 64° F. effective temperature. Persons working at various rates are most comfortable at effective temperatures below 64° F. The exact effective temperatures giving maximum comfort for persons working at various rates have not as yet been determined by the research staff, but, from the best data available, they are as follows: At rest, 64° F.; light work, 62° F.; hard work, 60° F.

So we may take it as a scientifically established fact, that, in the average home, the effective temperature should be 63° or 64°. Now, this sounds like a pretty cold atmosphere, as we are used to talking about 70° to 72° as being necessary for human comfort. But the temperatures cited above, as determined standards, are effective temperatures, and not the temperatures read from a common dry-bulb thermometer. What then is "effective temperature?" It is an experimentally determined scale, which is a true index of bodily comfort in all combinations of temperature, humidity and air movement.

. . . . You will be just as comfortable at a thermometer of 66° F. if there is enough humidity in the atmosphere, as you would be with the thermometer reading 72° F. and the air very dry. As a matter of fact you will be very much better off in the moist temperature and the furniture will not crack in the joints and fall apart; also you can have plants growing in the living and dining rooms —something impossible with the higher temperature-drier air.

In addition to these three major considerations, the research laboratory has set down as important factors, dustiness, bacteria content, odors present, and other injurious substances.

[1] In *Small Home*, September, 1929.

VENTILATION AND HUMIDITY[1]

By R. H. HEILMAN, M.E., E.E.,
Mellon Institute of Industrial Research

Perhaps the greatest obstacle to the proper ventilation of the home is the lack of knowledge of the exact nature of the atmospheric conditions required to produce the desired effect. Health officers and physicians throughout the country have been very much interested in this subject and have conducted many investigations, especially in schoolroom ventilation. Once the desired conditions have been accurately determined by investigations or otherwise, the heating and ventilating engineer is capable of producing the desired results.

However, much has been learned during the last few years in the science of ventilation. The old popular idea that the chemical composition of the air was the all important factor has been disproved, and attention has been given to many other factors of great importance. Among these latter factors we have air supply, air temperature, relative humidity, air motion, and air purity.

The chemical composition of the air in the home rarely becomes changed enough to produce harmful effects to the occupants, since in general the oxygen content has to fall to 16 or 18 per cent, and the carbon dioxide content rise to one to two per cent before harmful effects are produced. However, air which has been inhaled or made foul by breathing and by the combustion products from gas fires produces bad effects upon the body, both immediately and remotely. The immediate effects are dullness, oppressive breathing, headache, and general discomfort. The remote effects of foul air are a general lowering of bodily vigor and a vague weakness and lack of tone. Many authorities believe that these symptoms are not due to the changes in the chemical composition of the air (with the exception of the products of combustion from fires) but that they are due to excess temperatures, abnormal humidity, and lack of air movement, which affect the rate of liberation of heat from the body, for the symptoms just mentioned for foul air can be obtained with pure air heated to a temperature approaching that of the human body. Experiments have also shown that a group of subjects enclosed in an experimental chamber and suffering from the familiar effects of bad ventilation can in no way be relieved by permitting them to breathe fresh outside air admitted through a tube,

[1] Adapted from "Healthful Ventilation" (radio talk broadcast from University of Pittsburgh, 1929), *Science for the Home Manager: A Series of Fourteen Radio Talks* (University of Pittsburgh, 1929).

but can be completely relieved by cooling the vitiated air of the chamber in which they are imprisoned.

These foregoing facts indicate the relative importance of air temperature, air movement, and relative humidity.

You are no doubt all familiar with the meaning of the terms air temperature and air movement. A word of explanation, however, on the meaning of relative humidity may be of interest to some of you.

It is customary to express the conditions of the atmosphere with respect to moisture in the form of a ratio, termed the hygrometric state of relative humidity, which is defined as the ratio of the amount of moisture present in a given volume of air to the amount required to saturate this volume at the existing temperature. The relative humidity of the atmosphere in the home can be readily determined by the use of a wet and dry-bulb hygrometer. This instrument consists of two similar thermometers, hanging side by side, the bulb of one thermometer being dry and recording the atmospheric temperature, while the other bulb is kept wet by surrounding it with a piece of muslin connected to a wick immersed at its end in water. Owing to the evaporation constantly taking place on the surface of the wet bulb, heat is extracted from the mercury, and consequently the wet-bulb thermometer shows a lower reading than the other, which is exposed to the atmosphere. The relative humidity is readily determined from the readings of the two thermometers and a simple table which is supplied with the instrument. Relative humidity plays a very important part in the home in helping to regulate the comfort of the occupants. A person's feeling of warmth is not due alone to the temperature of the surrounding air as registered by a dry-bulb thermometer, for dry air at a relatively high temperature may feel cooler than air of considerably lower temperature with a high moisture content. In the average home, the relative humidity of the atmosphere is usually 25 per cent or less in the wintertime. This low moisture content of the air results in rapid evaporation from the body and the individual feels cold. A greater feeling of warmth is obtained with a dry-bulb temperature of 75° and a relative humidity of 60 per cent than with a dry-bulb temperature of 80° with a relative humidity of 15 per cent.

You can readily understand that it is therefore more economical to lower the temperature of the house and raise the relative humidity, the lower temperature requiring much less fuel.

The economy in fuel consumption resulting from higher relative humidities, however, is not the only benefit to be derived. Doctors now

trace common colds, grippe, influenza, bronchitis, pneumonia, and tuberculosis to the breathing of hot dry air in the home. The constant breathing of this hot dry air causes the mucous membranes of our noses and throats to become dry and irritated, thus lowering our resistance and making us supersensitive to dust and bacteria.

Ordinary attempts to increase the humidity, such as the placing of pans of water on radiators or the usual water tanks in the furnace casing, are generally of little benefit since they are not capable of evaporating enough water to do much good. To maintain a relative humidity of 35 per cent in a six-room house in zero weather, it is necessary to evaporate twenty gallons of water a day. This allows for one change of air an hour. To maintain the same humidity in the same house, with a 35 to 40° F. temperature outdoors, requires seven gallons of water a day, allowing for the same number of air changes an hour. To evaporate this much water per day usually requires a special form of evaporator or humidifier. Portable humidifiers which can be removed from room to room have been on the market for some time.

Just recently there has been placed on the market a heating and ventilating system for residences which automatically controls the relative humidity to any degree desired. The other essentials of good heating and ventilating of the home, such as air temperature, air motion, and air purity, are also taken care of by this new equipment. Since this equipment represents the latest advance in the heating and ventilating of the home, it may be of interest briefly to describe it here.

In this equipment, the warm air heating system is used. In this case the air is heated directly in the furnace by means of gas burners which automatically heat it to any desired temperature, the thermostat which controls the temperature being placed in the living room or any room desired.

Moisture is added to the warmed air by means of a humidifier. The quantity of water evaporated is controlled by a float valve which regulates the level of the water surface, insuring a constant relative humidity without the necessity of filling any pans by hand. The float valve can be set to give any desired relative humidity. For a temperature of 70 degrees F. a relative humidity of 35 to 45 per cent has proved to be very satisfactory.

Before the air is heated it is drawn through a filter, which consists of a mass of fine wire, like steel wool, pressed into a two-inch thickness. This filter removes the dirt and dust in the air, thus making it much more suit-

able for breathing and at the same time eliminating considerable dusting and cleaning of furniture, draperies, and so on.

The warmed, humidified, and cleaned air is then carried by ducts to every room and is distributed under pressure, without drafts and without hot or cold zones. This positive circulation of warm air insures a uniform heat in every room in the house. In the old hot-air systems there is usually one room or more which is very hard to heat owing to the inability of the gravity system to get sufficient warm air into the room.

Because of the fact that this equipment has been on the market for a very short time, it is probable that few of you have seen it in operation. I believe, however, that in the very near future many of the architects and building contractors will recommend such systems for heating and ventilating the home. While these systems at present are used only in the winter for heating, they will, undoubtedly, be used eventually to cool the home in the summer by substituting a cooling unit in place of the present heating unit.

[NOTE 1.—*Humidity and death rate:* Professor Ellsworth Huntington of Yale University has shown in his analysis of weather reports in relation to 60,000,000 deaths that a relative humidity of 80 per cent is associated with minimum death rates and that a higher or lower humidity has shown an increase in death rates. See Ellsworth Huntington, *Weather and Health* (National Research Council, 1930).]

[NOTE 2.—*Air-cooling systems:* There are on the market several systems and devices by which air may be cooled—a centralized system used when there is a centralized duct arrangement in heating and a unit system for the purpose of cooling individual rooms. This latter device is guaranteed to reduce temperature 10° in a room with 600 sq. ft. or less of floor space. For information on air cooling devices see Howard T. Fisher, "The Country House," *Architectural Record*, November, 1930, pp. 379–82.]

CONDENSATION

One of the inconveniences that results from the recommended relative humidity for comfort and health is condensation. Mr. Howard T. Fisher discusses remedies for condensation. He states in the following paragraphs taken from his article "The Country House":[1]

. . . . With well-insulated walls, however, condensation will occur only on the windows, where it can be taken care of, or even largely eliminated except during the coldest weather.

There is nothing inherently objectionable to condensation. In fact, to those persons who appreciate the comfort of a high humidity its presence is a pleasing indication that there is probably at least a fair amount of moisture in the atmosphere. Condensation is, however, the cause of two just complaints: Win-

[1] In *Architectural Record*, November, 1930.

dows covered with condensation cannot be seen through, and when the surplus moisture of condensation runs down off the glass it forms pools of water on the sills which may stain the curtains and walls. The latter objection can be entirely removed by the provision of adequate condensation gutters to carry off this water. Both objections can be reduced to a minimum by the use of double glazing. In addition to largely preventing condensation this has the further advantage that it reduces the total air infiltration and heat loss from the building, thus saving fuel. Charts prepared by the University of Illinois show that with an inside temperature of 69° and a humidity of 60 per cent condensation will occur on single glass when the outside temperature is only 48°, but will not occur on double glass until the temperature is as low as 19°. Or, expressing this differently, with an outside temperature of 20° condensation will occur on single glass when the humidity reaches 30 per cent, but will not occur on double glass until it reaches 60 per cent. Even with zero weather outside double glazing will permit a humidity of approximately 50 per cent unaccompanied by any condensation whatever. The ultimate solution to the problem of condensation as well as heat loss may be found in the vacuumized window pane.

Double glazing can be accomplished in a variety of ways, but the most important requirement is air-tightness. Both sheets of glass may be set permanently in the same frame, but in this case the glazing should be done during weather as dry as possible. For greatest efficiency the air space between the glass should not be less than one inch in thickness. Even if the glazing is relatively air-tight, dirt will eventually filter in and the glass will require cleaning, which will be difficult to accomplish unless provision is made for the easy removal of the glass. Where such double glazing is contemplated in conncetion with steel sash it should be remembered that moisture may condense on the interior surface of the metal even if the glass is double. It will usually be found more satisfactory to provide entirely separate frames and glass, placed either inside or outside of the regular window, and stored during the summer. These can be made completely interchangeable with the screens, the same hinges or fasteners being used for both and the putting up of the screens and taking down of the winter sash accomplished at one operation. In order to get as air-tight a fit as possible it may be worth while to use weather-stripping, perhaps of the cloth-lined variety.

SUMMARY

The first consideration in satisfactory house heating is a good structure. The two general types of heating are direct and indirect systems. Most systems are capable of heating a house to 70° at the breathing line, but there is often in cold weather a great difference between the breathing-line temperature and the floor temperature. Experience has shown that the cheaper the heating system the greater the air-temperature difference

between floor and ceiling. There is considerable difference in cost of equipment and cost of installation of the various heating systems but the cost of operation, providing the same fuel is used, varies little. The selection of a type of heating depends upon the individual home-owner, the house, and its location.

According to scientific research and experimentation the average home temperature should be 63° or 64° with the proper amount of humidity. By relative humidity is meant the ratio of the amount of moisture present in a given volume of air to the amount required to saturate this volume at the existing temperature. By ventilation is meant the natural or mechanical replacement of vitiated air by fresh air.

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CHAPTER IX

PLUMBING

This chapter is not intended to give the reader a scientific knowledge of plumbing or of the mechanical operation of plumbing equipment but to indicate and emphasize those essentials and principles of importance to the home-owner and to others who are interested.

PLUMBING TERMS[1]

The "plumbing" of a building, as the term is commonly used, includes the pipes for distributing the water supply, the fixtures for using water, and drainage pipes for removing waste water and sewage, together with fittings and appurtenances of various kinds, all within or adjacent to the building. The "service pipe," which forms the connection between the water main and the building, and the "house sewer," which conveys the waste water and sewage from the building to the street sewer or other point of disposal, are included in the "plumbing system" of a building, using the term in a broader sense. Connections for rain water are also included if the water is discharged through a house sewer or a house drain. The water supply and drainage system are mutually dependent. Drains are needed to carry away the used water; water is needed to cleanse the fixtures and transport solid wastes.

DEFINITIONS OF TERMS

Plumbing.—Plumbing is the art of installing in buildings the pipes, fixtures, and other apparatus for bringing in the water supply and removing liquid and water-carried wastes.

Plumbing system.—The plumbing system of a building includes the water supply distributing pipes; the fixtures and fixture traps; the soil, waste, and vent pipes; the house drain and house sewer; the storm-water drainage; with their devices, appurtenances, and connections all within or adjacent to the building.

Water-service pipe.—The water-service pipe is the pipe from the water main to the building served.

[1] From *Recommended Minimum Requirements for Plumbing* (subcommittee on plumbing of the Building Code Committee, U.S. Department of Commerce, 1929), p. 5. Obtainable from the Government Printing Office, Washington, D.C.

Water-distribution pipes.—The water-distribution pipes are those which convey water from the service pipe to the plumbing fixtures.

Plumbing fixtures.—Plumbing fixtures are receptacles intended to receive and discharge water, liquid, or water-carried wastes into a drainage system with which they are connected.

Trap.—A trap is a fitting or device so constructed as to prevent the passage of air or gas through a pipe without materially affecting the flow of sewage or waste water through it.

Trap seal.—The trap seal is the vertical distance between the crown weir and the dip of the trap.

Vent pipe.—A vent pipe is any pipe provided to ventilate a house-drainage system and to prevent trap siphonage and back pressure.

Local ventilating pipe.—A local ventilating pipe is a pipe through which foul air is removed from a room or fixture.

Soil pipe.—A soil pipe is any pipe which conveys the discharge of water-closets, with or without the discharges from other fixtures, to the house drain.

Waste pipe and special waste.—A waste pipe is any pipe which receives the discharge of any fixture, except water-closets, and conveys the same to the house drain, soil, or waste stacks. When such pipe does not connect directly with a house drain or soil stack, it is termed a special waste.

Main.—The main of any system of horizontal, vertical, or continuous piping is that part of such system which receives the wastes, vent or back vents, from fixture outlets or traps, direct or through branch pipes.

Branch.—The branch of any system of piping is that part of the system which extends horizontally at a slight grade, with or without lateral or vertical extensions or vertical arms, from the main to receive fixture outlets not directly connected to the main.

Stack.—Stack is a general term for any vertical line of soil, waste, or vent piping.

House drain.—The house drain is that part of the lowest horizontal piping of a house drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of any building and conveys the same to the house sewer. . . . .

House sewer.—The house sewer is that part of the horizontal piping of a house drainage system extending from the house drain . . . . to its connection with the main sewer or cesspool and conveying the drainage of but one building site.

PLUMBING ESSENTIALS[1]

By ROBERT T. JONES
Technical Director, Architects' Small House
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. . . . What can an architect say that will help the small home builder to get a bounteous supply of water where he wants it, so that he will not have to think of that part of the plumbing system again? In the first place, he can make large use of brass pipe. There cannot be any argument about this being the best material. The simple fact is that it does not break down and does not rust. Furthermore, it does not become stopped up with lime deposits. The other factor about it is extra cost. If you cannot afford brass pipe that is all there is to the question for you. But first be sure you cannot afford it, for it is worth its cost and it is worth making some sacrifice to get it. Steel pipes about the house heater and hot water tank rust more rapidly than elsewhere. If one cannot do more at least these should be of brass.

Enough about materials. What else can the architect offer on the subject of water supply piping? This; install stops. Have you ever had the faucets over your sink get out of order only to find that the simple task of replacing gaskets or valve seats first required shutting off the water over the whole house? It is a common experience. Stops, or inexpensive valves, placed on the water supply to these fixtures eliminate this nuisance. If you cannot afford even this little added expense then drip cocks can be placed on the more important water lines in the basement. They will save many occasions for annoyance. The cost is inconsiderable.

The hot water supply deserves careful study also, principally as to the way the water is heated. The simplest arrangement is a coil or crook of piping run over the house heater fire. Unbiased engineers have shown that this is an expensive method of water heating for it cuts down the efficiency of the house heater, especially when the weather is very cold, for then it overheats the water without an appreciable effect on the temperature in the house. Furthermore these pipes over the fire gradually stop up with incrustations of lime, become less and less effective and finally break, requiring costly replacements. Needless to say, they do not work when the house heater is off and then an auxiliary gas water heater is necessary. In a plan such as this the auxiliary heater is often a rudimentary affair that burns much gas and at best provides only an inter-

[1] Adapted from "Plumbing—What You See and What You Don't," *Small Home*, January, 1930.

mittent supply of hot water. A much better scheme is provided in an automatic hot water heater that works in all seasons. There are many types of equipment of this sort, but fundamentally the best ones for small houses are those that include the heating unit within the hot water storage tank itself, or else those that heat the water instantaneously. In the former the tank is thoroughly insulated. With hot water in the tank there is barely perceptible warmth in the outer jacket of the tank. The burner operates under control of a thermostat, thus when water temperature drops to a certain point the gas flame is turned on. It goes off when the temperature rises to a fixed point.

There is a limit to the amount of hot water that can be drawn from this outfit, for the production of water is not instantaneous. Yet there is a full tank of water, enough for almost any case. This type of equipment is especially recommended for homes having shower baths, for fluctuations in the temperature of the water at the shower head are not so likely to be marked as with the instantaneous type.

The instantaneous heater is recommended where there is a continuous and heavy demand for hot water, as in a rather large house, and also for the small house where hot water may be required infrequently. Here hot water is produced only when the hot water faucet is open, thus if by chance there should be no one at home through the day, there would be no production of hot water at all, and the only expense entailed would be that of keeping the small pilot light going. With the automatic instantaneous hot water heater the supply of hot water is practically unlimited.

Now which will you take? A water heating plan that involves a furnace coil that will need replacements, that will rob your heater, that will not give you at any time all the hot water you may want and none in summer, late spring, and early fall, with a cheap and inefficient auxiliary heater that has to be turned on and off, is expensive to operate and thus gets turned on principally only for the proverbial Saturday night? Or will you add a little money to your first expenditures and get a boundless supply of hot water all the year? It seems to me the answer is manifest. So much for that, only buy a water heater that bears a guarantee backed by a good name.

If you choose the storage water tank, have it of copper. The difference in cost between a copper tank and a steel tank will be made up almost before you know it by savings in fuel, and you will never have a rusted out heater that has to be plugged to make it last a little longer, or else replaced.

Faucets, like every other mechanical device can be cheap and nearly worthless or they can be elaborate to the point of magnificence. Design, kind and amount of metal used, operating device, all of these take their part in fixing the worth of the faucet. They can be of light metal with poor plating and trouble-making working parts, or they may be of solid brass or bronze with heavy nickel or chromium plating and working parts that will stand a lot of abuse and, when worn, are easy to replace. The renewable feature of any faucet is an extremely important part of it, for when the faucet is closed against the water pressure there is bound to be wear. A well-made faucet requires infrequent repairs and has an easy method of making repairs.

As far as the finish is concerned, one has a choice of many metals; nickel, chromium, silver and gold. The latter two, of course, are manifestly extravagances. Of the nickel and chromium the former is brighter, takes a very high polish. Chromium has a bluish-silver lustre quite unobtrusive and beautiful. Chromium does not corrode with ordinary usage and does not stain. It costs more and is worth it.

Looking through the catalogues of many manufacturers of faucets even the architect is likely to be appalled at the multiplicity of different types and designs and the different character of finishes. But he would begin to make a choice by a process which I do not hesitate to recommend to you. He would eliminate every type that was not backed by a high grade manufacturer. The architect knows from long experience that when he chooses a faucet from such a source, the manufacturer will be as insistent as the owner that the faucet make good. If it does not, it will be replaced and the owner will be satisfied. That is a basic principle underlying all high grade manufacturing.

When it comes to making a choice as to design of faucets purely from the point of view of appearance, taste is involved heavily. Personally I like the unobtrusive kinds, and I prefer the all-metal types rather than those of china. This is a matter of taste, although the metal ones are clearly more permanent.

People generally prefer in the lavatory a combination faucet, so that one may have tempered running water at that place. If rigorous economy must be practiced, double faucets may be used.

The cheapest kind of stopper will be the rubber one with a chain on it. The more modern one is a pop-up waste operated from a knob.

The kitchen sink should certainly have a swinging spout combination

faucet with a metal or porcelain soap dish. Many who work in kitchens also like a transfer valve on this faucet so that the water may be passed through a rubber hose to spray china.

The shower head is another fitting to which it is worth while giving some study. Plumbing catalogues are replete with them. The shower head should be of cast brass, with a removable face so that it can be taken off and cleaned. The whole head should be on a ball bearing. There should be a mixing valve that will be a reasonable assurance against scalding.

Faucets for laundry trays and for hose connections can be of dull brass, and provision should be made for hose connections in the basement, preferably for both hot and cold water.

One thing more about the water supply and then we will be through with this part of it. This is the water softener. From one point of view perhaps this may be thought of as a luxury and perhaps it is. But it is also an extremely satisfactory part of a complete plumbing installation.

It works by passing the service water directly through a mineral, which has what the chemists call an affinity for the elements that harden water, —the sulphates of magnesia and lime and the iron. The water passes through the mineral, leaves these hardening or soap destroying elements behind, and passes on otherwise unchanged and the water is softer and cleaner and more pure than rain water. Operating costs are low.

That brings us to the sewage disposal system. City ordinances invariably define the exact methods and materials to be used so providing a good contractor is employed there is not much an architect can add that will be of service save the advice to include adequate cleanouts. A cleanout is what its name implies—an opening in the drainage lines through which the plumber may insert tools for the purpose of removing obstructions. The rule is that they should be installed wherever the drainage lines change direction. The practice is to use them far less frequently. The argument in support of cleanouts will be manifest to all. A single job of removing pipes that cannot be reached with the plumber's rod, because of a change in direction of the piping, will cover the initial cost of cleanouts many times over.

One of the most important items in connection with the sewage disposal lines is the way they fit into the house framing, especially where they must cross wooden joists. Many a joist has been utterly ruined by injudicious cutting to accommodate a large pipe. These pipes should go between the joists not through them. . . . .

To have such matters worked out properly requires foresight and that means practically the employment of an intelligent contractor who will be considerate of your interests.

Now the third part in this trilogy about plumbing—the fixtures. Like every other thing about the house there are two phases to this. One is the quantity and the other is the quality. It is the disposition of those who build very fine houses to be generous with the plumbing accommodations. The prospective home builder looking over the plans of houses of larger size will be surprised at the magnificence that these more expensive houses offer on this score. Many provide complete bathrooms for every bedroom, with additional toilet facilities on the first floor. But the man who must build from limited means will have to decide for himself how far he can and should go in supplying like luxuries for his own home.

It is no doubt quite true that the more commodiously a house is fitted with plumbing fixtures the more readily it is sold. One has only to read advertisements of houses for sale to see how true this is because these advertisements in a very large number of cases make note of the fact that there are two bathrooms or a bathroom and first floor toilet. Evidently people think well of the convenience and comfort such installations afford. But if one can not afford two bathrooms completely equipped he can still go far toward getting practically equivalent accommodations by putting the water-closet in a compartment separate from the other fixtures and having a plan that contemplates the installation of tub and lavatory in one room and a shower and lavatory in another. If the arrangement of this equipment is such that they stand back to back, so that a single drain pipe and vent through the roof will accommodate them all, a marked economy is obtained.

It should be observed that there is a definite trend toward the inclusion of some sort of a shower in houses even of the simplest kind. This may be in connection with the tub or it may be in a separate compartment. A shower head over the tub does very well and its economy speaks for itself, but there is always some difficulty, which is not always overcome, of making a water-tight joint between the wall and the tub. One must be careful with a shower arrangement of this type, so that excess water is not splashed on the wall. On the other hand, a shower compartment constructed separately, made of metal throughout, both sides and base, supplies its own protection from the point of view of waterproofing and practically eliminates the whole problem of leakage.

The manifold arrangement of showers, tubs and other fixtures in the bathroom are such that it is impossible for me to go into much detail on this score. Everyone knows they may all be placed in one single bathroom. But it has been shown quite clearly, as I have said before, that when we put shower and lavatory in one room and bath and lavatory in another, with water-closet convenient to both, we get a flexibility of arrangement that commends itself to everyone.

Eventually, as a matter of course, fixtures must be selected. The multiplicity of these is such as to carry an adequate discussion of them completely beyond the possible confines of this article. One has only to know that every one of these fixtures is offered in many designs and also in many colors, as well as, of course, in many prices. The cheapest ware is made of cast iron which has a glazed enamel surfacing. Another range of expense includes fixtures made of burned clay with a glaze of porcelain. The most expensive is solid porcelain throughout. The sewer fixture—the water-closet—must be of porcelain. Plumbing ordinances require that. The other fixtures may be obtained in any of the three wares, with price ranges of the widest sort. The first quality in any of the glazed ware shows a surface without defects.

The best way for a home builder to make sure of the fixtures that he wants is to make a choice from a demonstration of the fixtures themselves. Pictures and catalogues do not tell the story half as well as the fixtures do themselves.

To give a very brief example of how even the simplest fixture may be elaborated from a rudimentary type to one of the most elaborate order, we may take the case of the kitchen sink. In the elementary form this is the familiar vessel with a back on it reaching up the wall some six or eight inches and with a flat metal rim around the edges supporting on one or both sides a wooden drain board. The bottom of the sink is painted. With the next step the metal flange or edge becomes a rolled rim. With the next one the roll gives place to an apron which extends down to cover the bottom of the sink, all, of course, enameled. The next degree of excellence finds a sink with the drain board cast integrally with the sink. This may be on one side, either right or left, or on both sides. If china ware is substituted in place of metal we get into new areas of expense. And if this kitchen sink also includes integrally with it one of the modern dish washers we have the final added touch of luxury. Color is an added quality to be obtained in most of these types.

[NOTE.—The cost of plumbing of a house usually varies from 6 to 10 per cent of the total cost. Mr. H. Vandervoort Walsh states the following: "The smallest system consists of one bathroom, two laundry tubs, and one kitchen sink; all of which costs about \$800. For every additional bathroom, drained into the same vertical soil pipe, about \$400 must be allowed. If, however, the additional bathroom must have a special drain line of its own, it will cost about \$525. A small wash room on the first floor will cost about \$150. . . . . These estimates are based upon union labor wages and average priced fixtures, which run about as follows: Built-in bathtub—about \$105. Lavatory—from \$40 to \$60. Water-closet—\$45–\$80. Built-in showers—about \$225" ("Simpler and Better Plumbing," *Arts and Decoration*, April, 1930).]

THE IMPORTANCE OF SELECTING GOOD PLUMBING EQUIPMENT[1]

BY NORMAN J. RADDER
Plumbing and Heating Industries Bureau

With the increased appreciation of the need for adequate plumbing equipment has come an increase in the variety of styles and types of fixtures available. This has had the unfortunate effect of confusing the public. The impression prevails that a tub is a tub, no matter what the price or by whom installed. The mystery surrounding plumbing has been still further deepened by lack of salesmanship on the part of some general contractors who have given prospective builders the impression that building a home is a complicated operation which no one but an expert can understand.

The truth is that the building of a house need not be a complicated matter and should cause no regret to the owner either in the process of construction or during the years that it is lived in, providing the owner chooses his materials and fixtures carefully and wisely, heeds the advice of experts, and deals only with responsible and established builders.

This advice applies with especial force to the man and woman who are selecting the plumbing fixtures for a home. Could the millions of Americans who in years past have built homes stand before a microphone and give their advice to the prospective builder, it would be unanimously "Buy good plumbing fixtures."

This is the consensus of opinion on plumbing fixtures for three reasons. In the first place, there is a direct relation between plumbing fixtures and health; in the second place, inferior plumbing fixtures are not durable and hence most expensive over a period of years, and last, the good fixture is built for a lifetime of service and retains its beauty and luster indefinitely.

[1] Adapted from "Building for Health," *American Home*, February, 1929.

The relation between plumbing and health has been recognized by over 800 cities and 15 states which have enacted laws and ordinances regulating the manner in which plumbing fixtures shall be installed. Unfortunately, not all of these are enforced. However, the home-owner who deals with a master plumber of established reputation will be safe whether there is a city ordinance or not.

The typical sanitary ordinance outlines the methods by which connections must be made, specifies the installation of waste lines, gives definite rulings on the installation of traps and vents, and indicates how fixtures should be installed.

Thus a sanitary code protects the home-owner against himself as well as against an irresponsible plumber. By specifying the number and manner in which traps and vents shall be connected, the home is protected against sewer gas and against contamination of the water supply.

In this manner, forward-looking cities have done everything in their power to guarantee to home-owners the full benefits from their plumbing equipment and have endeavored to assure them of the minimum cost of upkeep. Unfortunately, cities cannot regulate the quality of fixtures that shall be installed. This is still left to the judgment of the individual building his home. The result is that many who find that the cost of a home is going to exceed their original estimate seek a place to cut costs and often buy plumbing fixtures of inferior quality under the delusion that it is economy.

In plumbing fixtures as in other things, the purchaser gets what he pays for. Cheap plumbing fixtures do not have good enamel. The fixture proper is also of a much cheaper and thinner material. If the purchaser were to compare this cheaper grade of fixture with one of quality, he would soon see the difference in the appearance. These fixtures do not have the snow-white finish that the quality fixture has. They are of a yellow shade with a poor grade of enamel that in time turns to a darker yellow, chips easily and eventually becomes porous. When the enamel surface is in this condition, it is very hard to clean and catches the filth from the waste water, making it an ideal breeding place for dangerous germs. Quality fixtures have a grade of enamel which retains its snow-white finish. They are very easy to clean. These quality fixtures can be purchased with an acid-resisting finish which will not become marred by the acids contained in fruits, vegetables, and medicines.

Various grades of fixture trimmings such as faucets, traps, and waste pipes are on the market. Here again, quality pays. Cheap faucets will

give trouble sooner or later. It will not be long before they will not shut tight and this will lead to dripping of water which may discolor the enameled surface of the lavatory, tub, or sink.

If the home-owner tries to save money in buying cheap traps, he will find himself defeated in a few years when the traps begin to corrode and rust away. Cheap traps are made of thin metal that will not long resist corrosion. Doubling the thickness of the metal from which the trap is made will triple or quadruple resistance to corrosion. Furthermore, many cheap traps have joints which are similarly short lived.

A word more should be said on the subject of traps. A trap is a device or pipe bend under the lavatory, sink, or other fixture, with or without enlargement, which retains a sufficient quantity of the water that passes through it to prevent the passage of foul air back through the pipe and into the room. There are many kinds of traps. The S trap, P trap, and drum trap are in most common use.

The water standing in the trap is called a seal. It is effective when the water is deep enough to close the pipe entirely and thus prevent the passage of air from the drainage system back into the house. If it stands lower, space is left above the water for the passage of foul air back through the pipe, and the seal is "broken."

Under no circumstances should a sink, lavatory, bathtub, or laundry tub be installed without a trap. If the trap is omitted, sewer gas will fill the house. While doctors no longer regard sewer gas as the grave menace to health that it was thought to be 25 years ago, still the fact remains that sewer gas is vitiated air and, if breathed continually, will have an injurious effect on health.

Neither is it true, as was formerly believed, that sewer air contains, to a dangerous extent, the germs which cause diphtheria, typhoid, and many intestinal diseases. The chance of direct bacterial infection from the air from drains and sewers is extremely slight. It will, however, slowly and insidiously cause a general languor, which incapacitates for sustained effort. However, as indicated above, if the home-owner has purchased good fixtures he will have good traps, and good traps will not allow sewer gas to get into his house.

Fixtures that have their traps properly vented will also discharge the waste water much faster and quieter than those that are not vented properly. If the joints that connect the piping used in plumbing installation are properly made, the life of the installation will be greatly in-

creased. It is not uncommon to see houses in which the walls of the room below the bathroom have been ruined by a leaky joint. Unquestionably the material used and the workmanship in such installation was not of standard quality.

The home-owner should never be satisfied with anything less than pipes of standard quality purchased from a master plumber of unquestionable reputation. While the bugbear of sewer gas has been largely dispelled by increased scientific knowledge, recent investigations have proved that ground pollution occurs through leaks in soil pipes.

Leaking pipes, whether supply or waste pipes, are common causes for dampness in a house, and dampness is one of the worst possible defects in the home.

Properly-designed fixtures will eliminate another danger: They will not allow the waste water to contaminate the fresh water supply—a serious and deadly menace. The purchase of good plumbing pays big dividends in comfort, convenience, health, and pride of ownership. When fixtures of good quality are bought, the total cost of the plumbing fixtures and installation is only 9.9 per cent of the total cost of the home. The first cost is the last cost. If the fixtures are not wisely bought, however, they will sooner or later break down under the strain of daily use and then there will be the cost and inconvenience of repairs.

Furthermore, the home with the good plumbing fixtures has that greatest of all assets—complete sanitation. The prediction has been made that not many years will pass before purchasers will demand not only a clear legal title to a home, but also a certificate of sanitation—a certificate that will leave no room for doubt that the plumbing equipment will protect the family.

PROGRESS IN FIXTURE DESIGN AND MATERIALS

Extensive progress has been made in the use of materials for plumbing fixtures and equipment. Sanitation doubtless is the greatest consideration but comfort, labor-saving, and attractiveness are others of importance. Vitreous china is most desirable for wash bowls and the most sanitary for toilets. However, enameled iron is frequently used for both tubs and bowls. The unit faucet, which mixes hot and cold water, is a convenience and most satisfactory for the kitchen. Chromium-plated faucets, although more expensive, will save energy spent in the care of fixtures, and they are also attractive. Acid-proof enamelware is a worth-while con-

sideration for the kitchen sink where stains are common from fruits and vegetables. Built-in bathtubs and pedestal bowls for the bathroom are an advance over the old types.

Color in fixtures has been introduced during the past few years. The choice of color is an individual matter, but since renewing fixtures is expensive the selection of color should be such that will harmonize well with a number of other colors in order that changes in color schemes, particularly the color of walls, may not be handicapped or become too difficult.

FAUCETS[1]

By NORMAN J. RADDER
Plumbing and Heating Industries Bureau

Freedom from repairs—this is the ideal toward which the plumbing brass industry has been striving. Designers have done their utmost to attain simplicity and efficiency in the mechanical parts of the faucet.

A leak in a faucet starts when the faucet begins to drip. Hence, faucet engineers began their task of improving the faucet with a study of what causes faucets to drip, and therefore devoted their attention particularly to an improvement and a strengthening of those parts of the faucet involved in this problem. Out of this research have come numerous improvements in faucet seats, in the composition of the material out of which faucet washers are made, in the mechanism for bringing the washer down on the seat, etc.

There is only one thing with which the faucet engineers have found themselves unable to cope—that is the abuse of the faucet by the person using it. A faucet is abused when it is not completely turned off and allowed to drip. The action of the water cuts the seat and wears crevices in it just as a tiny stream trickling through a dike will wear a hole which will assume dangerous proportions. Another common abuse of the faucet is the application of too much pressure in closing it. This, too, damages the washer and seat and has a tendency to throw the mechanism out of line.

Obviously, a faucet is only as good as the metal from which it is made. Reputable manufacturers—those who sell their products through competent and established master plumbers—understand the metallurgical problems involved in the manufacture of brass that will stand up under the daily use in the home.

Manufacturers who do not hesitate to guarantee their faucets are extremely careful about the brass mixture. In addition to a high copper con-

[1] Adapted from "Some Facts about Faucets," *Small Home*, February, 1931.

tent, the mixture must be such as to permit accurate machining and insure against sand holes and other similar defects which are often caused by the use of a haphazard mixture.

Years ago nickel was the standard plating for faucets. Nickel, however, must be polished frequently in order to maintain its appearance. After years of polishing, nickel loses its luster and eventually all the plating is worn away and the brass shines through. The use of cheap polishing compounds, which are invariably very abrasive, hastens this wearing of the nickel. The polishing necessary to keep nickel is distasteful to the housewife.

Thus, for a number of reasons the plumbing industry as well as the housewife has hailed the use of chromium as a plating for faucets and fittings.

Chromium is distinctively the metal of this labor-saving age. It needs no daily polishing and scouring. Just an occasional wiping with a cloth is all that chromium needs to retain its luster. Chromium is hard and durable. It does not dull, corrode, or tarnish. Chromium is highly resistant to fruit and vegetable acids, gases, salt, air, and other elements which dull and discolor most other metals and finishes. When properly applied, it will give lasting service—just how long no one knows because chromium has only recently come into general use.

Chromium-plated fixtures naturally cost more than nickel-plated fittings because of the price of the plating solution and the more difficult process of application.

Unfortunately for the public, there are ways to cheapen chromium plating. A faucet may be given just a "flash" of chromium, that is, it may be left in the chromium bath for only a short time. For the average person, it will be difficult if not impossible to tell the inadequately coated piece of chromium from the thoroughly coated fitting which has been in the bath for half an hour and has been polished and buffed. Time alone will tell. . . . .

There are various kinds of handles for faucets. A handle may be of metal and plated with any of the platings just mentioned or it may be of china or of glass.

Handles are made in a variety of styles and shapes. Everyone, of course, is familiar with the lever type of handle. This may be made of metal, china, or glass.

The most popular type of handle is the four-arm handle, which, as

the name indicates, has four arms which may be used for turning. This is made in metal, china, and glass.

Some manufacturers make a three-arm handle and others make four-arm handles with metal balls at the end, and a five-arm handle.

One manufacturer has introduced a radical change in handle construction known as the handle with "finger-tip" control. Since one of the prevalent abuses of the faucet is for the user to seize the handle and turn off the water with all the strength he has in his hands, this manufacturer reasons that if a faucet has a handle which can be manipulated with the fingers only, the chances for damage to the faucet seat are greatly lessened. . . . .

We turn now to a detailed examination of the faucets made for different types of fixtures.

Let us step into a modern kitchen with an up-to-date sink with two deep compartments for washing and rinsing dishes and a roomy drain-board.

We see on this type of sink a faucet utterly unknown to the housewives of a generation ago. It is a faucet with a swinging spout through which the housewife may draw hot water, cold water, or tempered water. The swinging spout permits her to send the water into either compartment. The compartments are eight inches deep and equipped with a clever combination stopper and strainer. At the twist of the lever, the metal stopper finds its seat and the water sent into the sink is kept in the compartment. This device makes the dishpan and dishrag obsolete because the deep compartment itself serves as a dishpan.

After the dishes have been washed, they may be rinsed with scalding hot water from a hose and spray. . . . . In some faucets, the hose is attached to the swinging spout; while in other faucets, there is a separate connection for the hose and the water is sent through either the hose or the spout by the turning of a diverting valve.

The soap dish mounted on the faucet may be metal or of vitreous china. Here again, as in many other things, the purchaser gets exactly what he pays for. Quality faucets have either a chromium plated soap dish or a dish made of genuine twice-fire vitreous china. Inferior faucets have a china soap dish made out of second-rate clays fired at a low temperature. These dishes will eventually show stains made by the acids in the soap, or crazes, that is, hair-line cracks in the glaze.

Progressive manufacturers have spared no pains to make their best

kitchen faucets the last word in efficiency and in construction. Recognizing the fact that crevices are dirt-catchers, they have so constructed their faucets that there are no inaccessible places. . . . .

A triple faucet is made for use in districts where a connection for drinking water is needed in addition to the customary hot and cold water connection. . . . .

The valves for the kitchen sink faucet may be entirely concealed behind the wall. . . . .

Most interesting, too, are the changes that have taken place in the construction and design of faucets, escutcheons, and drains for lavatories. They may be summarized as follows:

1. Beauty, distinction and symmetry of form and line, ...
2. The combination faucet which enables the user of the faucet to wash with tempered water.
3. Concealment of valves.
4. The use of the pop-up drain control methods to replace the obsolete plug and chain.

There are four advantages of the combination faucet: It enables the person using the lavatory to wash in tempered water; washing in tempered water results in a saving of hot water with consequent economy of gas or whatever fuel is used to heat the water; there is more space on the slab of the lavatory for toilet articles or other accessories; and there is less metal to clean.

Economy of space on the lavatory slab is an advantage of the combination faucet. More and more to-day the bathroom is being used as a dressing room. The number of toilet articles and accessories produced is constantly increasing. While the plumbing industry produces special dressing tables that match lavatories and while some lavatories are made with room at the side for use as a dressing table, the fact remains that most people will continue to use the conventional lavatory for resting toilet articles. When a combination faucet is used, practically the entire slab is free for use as the person may wish.

There is still another way to get even more space on the lavatory slab. This is by concealing the control valve in the wall and supplying tempered water through a china spout which is an integral part of the lavatory. When this is done, only the pop-up drain control is on the lavatory slab.

We turn now to the faucets and fittings available for bathtubs. Bath-

room conditions and bathing habits differ. One arrangement of supply and waste will prove most convenient and satisfactory to some; others will prefer a different one. But all want fittings that are lasting and not likely to get out of order. A good tub deserves a good supply and a good waste. The importance of the latter is frequently overlooked by many people who build or buy houses. A cheap waste is an inefficient waste; it will drain the tub so slowly that most persons will become impatient while waiting for it to drain. The ring around the tub which results will increase the housewife's work of cleaning the tub.

The tub on legs is out-of-date and with it have gone exposed pipes for the bathtub. All the supply pipes for the modern bathtub are concealed.

In conclusion, attention should be called to improvements in the internal mechanism of the faucet. While years ago nearly all faucets were Fuller faucets, today all faucets are compression faucets. A modification of the compression faucet is very popular today. This quick compression faucet closes with from one quarter to a half turn while the compression faucet closes with one turn.

There are different ways in which this quick closing of the faucet is attained. Some manufacturers use a thread with a steep pitch. Others use a double thread. The double thread is said to have the additional advantage of making the construction of the faucet more rugged and preventing possible wabbling of bath faucets with a long stem.

The compression faucet derived its name from the fact that it shuts off the water when a composition washer is made to close on a metal seat. The washer and the seat, therefore, are the two parts of the faucet which receive the greatest amount of wear. All faucets are so constructed that the washer may be easily replaced. It has taken more ingenuity, however, to devise methods of making the seat renewable.

It is cheaper to make a faucet with an integral seat. When the seat of a cheap faucet is damaged, it is possible to trim the worn edge away with a special reseating tool, but usually this is as expensive as the purchase of a new faucet.

All better grades of faucets have some kind of a renewable seat. Various manufacturers have attained this end in different ways. Some have the seat in a barrel which easily slides out of the faucet. Others have a kind of disc seat which is readily removable.

To minimize the effect of the grinding motion which takes place when a washer is forced on the seat as the faucet is closed, some manufacturers

have perfected a swivel movement in the part holding the washer. The effect of the swivel device is to allow more play in the seating action and to equalize wearing by preventing the washer from coming in contact with the seat in the same way every time it is closed.

The advantage of all these improvements will be more readily apparent when one remembers that damage to faucet seats results from failure to close the faucet with consequent dripping of water and cutting of the seat by the presence of foreign elements, such as metal, shavings, sand, etc., in the water.

The better faucets have anti-splashing devices built in the spout. There is also a difference in washers. Cheap washers give trouble in the hot-water faucet because they will swell up. When a faucet needs a new washer, it pays to buy it from a plumbing contractor because good washers will give many years of service.

PLUMBING AND HEALTH

A subcommittee on plumbing was appointed in 1921 under the Building Code Committee of the United States Department of Commerce. The purpose of this committee was to investigate the underlying principles of plumbing in order to recommend minimum requirements for plumbing codes and local ordinances. Most of the plumbing work of a dwelling is regulated by local ordinances or codes in communities where such exist, and is then passed upon by the local inspector. Many of these codes lack uniformity, some are obsolete, and there are unaccountable differences in regulation. There are at present a number of states that have enacted plumbing laws. These hold plumbing practice to certain main requirements. Several hundred cities also have adopted codes. Health is the basis on which such legislation is enacted.

The purpose of this subcommittee has been to prepare minimum requirements based on good plumbing principles and to draft a code based on these requirements. The relation of plumbing to health is discussed briefly in the following paragraphs of the subcommittee's report:[1]

> The work of the committee has emphasized the necessity of considering the plumbing systems of buildings as intimately related to and forming an integral part of public water-supply and sewerage systems. The number and character of plumbing fixtures in a building are largely matters of individual choice, and owners have not sufficiently considered their relation to features of public serv-

[1] *Recommended Minimum Requirements for Plumbing* (U.S. Dept. of Commerce). Washington: Government Printing Office. 1929.

ice. Plumbing fixtures are the terminals of water-supply systems, and, to a large extent, control the quantity of water used. At the same time they are the beginnings of the sewerage system. The aggregate discharges from plumbing fixtures determine the flow in sewers and the volume of sewage reaching the outfall, this volume materially affecting the cost of any pumping or treatment of the sewage. It is evident, therefore, that the public interest may well justify a certain degree of governmental control over plumbing fixtures as affecting both the quantity of water available for public use and the economical operation of the sewerage system.

An important function of the house-drainage system is to carry away from plumbing fixtures human excreta and wastes which may contain disease-producing bacteria. Because of the possible presence of such organisms sewage may be dangerous and must be disposed of in such a manner that there will be no chance of disease transmission. Sanitarians to-day place great emphasis on the importance of sewage treatment and safe methods of ultimate sewage disposal.

The leakage of polluted water from the house-drainage system is insanitary and dangerous. Leakage within the house may pollute the habitation and permit food infection through the medium of insects. Leakage in the ground outside the house may pollute water supplies taken from neighboring wells or find its way into or under the building. The maintenance of water seals between fixtures and drains and the permanent tightness of plumbing systems are important not only because they prevent the passage of air, but because they prevent the access of insects to the interior of the drains and sewers. If cockroaches, water bugs, and other vermin can pass from drains to food, they may transport disease germs, and thus be a bacteriological menace to health. It is therefore important that the drainage system be tight and without danger of leakage.

L. O. Howard, chief of the Bureau of Entomology of the United States Department of Agriculture, and C. W. Stiles, United States Public Health Service, in personal conversation with the late chairman of the committee, are authority for the statement that insects can and do pass from the interior of leaking drainage systems to living quarters. Several other observers also report such occurrences.

Another danger to be guarded against is the use of fixtures in which the water supply and waste connections are so arranged that polluted waste water from the fixtures may, under certain circumstances, return into the water-supply pipes.

The line where the safe water supply ends and sewage begins is sometimes very finely drawn. If faucets with open spouts discharge over plumbing fixtures and if there is a break between the water supply and the waste pipe, self-protection exists against possible pollution of the water-supply distributing system by the back flow of waste water into it. Plumbing fixtures such as water-closets, urinals, bidets, bathtubs, and lavatories with direct connections, secret wastes and overflows, and combination cocks offer possible sources of pollution.

The air in sewers and drains often contains gases resulting from the decomposition of excreta, soap, fats, and other wastes, together with gases from mineral oils which may come from garages, streets, and industrial establishments. Illuminating gas may also find its way into sewers through leakage. Among these gases may be found methane, sulphuretted hydrogen, and carbonic oxide. In large amounts those gases are poisonous to the human system, and there are physiological objections to breathing them even in small quantities. Hence, the air of sewers or drains should be kept from entering buildings intended for human habitation or occupancy by the use of proper plumbing installations and by suitable ventilation of the rooms or compartments in which the plumbing fixtures are located. The smell of these gases and other emanations from decomposing organic matter is naturally repugnant to human beings. It not only offends the sensibilities, but may produce shallow breathing, headache, and even nausea.

In addition to the above facts, it is important to consider the bacteriological aspects of sewer and drain air, a subject upon which there has been some misunderstanding. In recent years bacteriologists have made studies which have thrown light upon this subject. They have shown by experiment that while sewage often contains disease-producing bacteria derived from human excreta and body wastes these bacteria are rarely found in the air which escapes from sewers and drains. Hence, it has been argued by some that escaping sewer air has no influence on health. The committee does not agree with this conclusion. Health may be influenced by factors which do not cause specific diseases, for there are chemical and physiological as well as bacteriological factors involved. The investigations thus far made by bacteriologists should be considered to be merely a beginning of larger and more complete investigations which will doubtless be made as the science of bacteriology advances. The committee is of the opinion, therefore, that until further light on this somewhat obscure subject has been obtained the escape of sewer air from the house-drainage system, at frequent intervals or in considerable quantities, threatens the health of the building's occupants.

This whole matter has a quantitative as well as a qualitative aspect. The temporary losses of water seal in traps, which rarely occur and which are immediately replaced, do not involve any great danger to the health of the occupants, for in many cases the final drainage from the fixture will renew the seal within a short time, but where a loss of seal is likely to be of frequent occurrence and not readily replaced, or where breaks in the system admit sewer air continually to a building, the health of the occupants is subject to the dangers heretofore described.

For the above-mentioned reasons regulations governing the installation of plumbing have been established by law in many places. These regulations have been potent in improving living conditions throughout the country; in fact, they have even set the standards for those places where plumbing is not under public

control. The knowledge now in possession of sanitarians in regard to the lessened bacteriological dangers of sewer air leads logically to some simplification in plumbing design, but it should not lead to an abandonment of practices necessary to protect buildings against the air of drains, which, in addition to its possible danger, is offensive to the smell.

The committee believes that good plumbing is a matter which concerns health. Government has the right to protect the people's health, but people also have rights, and plumbing regulations carried too far are unjust. Regulations which will not be supported by the courts fully and without question under a liberal interpretation of the police power may be regarded as unjust. Sanitary science, however, must be the guide to justice in this matter. The principles of science change as knowledge advances, and it is proper, therefore, that plumbing regulations be reviewed from time to time and, if necessary, revised.

SUMMARY

The plumbing of a building includes the pipes for distributing the water supply, the fixtures for using water and drainage pipes for removing waste together with fittings and appurtenances. Plumbing means the installation of proper fixtures, and other apparatus for bringing in water supply and removing liquid and water-carried wastes. Good plumbing and plumbing fixtures usually result in a saving as they will require but a small expenditure for upkeep. Brass pipes are desirable for the distribution of the water supply in the home. If brass is too expensive for the entire water system, they should at least be used around the house heater and hot-water tank. Stops or valves should be installed. The automatic hot-water heater is one of the most desirable methods of heating water. Consider design, metal, and operating device in selecting faucets. The renewable feature of faucets should be considered as there is bound to be wear. Chromium plate is desirable as it requires little care. For kitchen sinks the swinging-spout type is desirable. The most desirable kitchen sink is the one with sink and drainboards cast in one piece.

City ordinances usually define the exact methods and materials used in the home for sewage disposal, outline the methods by which connections must be made, specify the installation of waste lines, and give definite rulings on the installation of traps and vents.

Considerable emphasis is placed by sanitarians on the importance of sewage treatment and safe methods of disposal. Regulations governing the installation of plumbing have been established in many places as many cities have plumbing codes or local ordinances governing plumbing. These regulations have been important in improving living conditions

throughout the country and have been even instrumental in setting up standards where codes do not exist.

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CHAPTER X

REFRIGERATION

ELECTRIC AND GAS REFRIGERATORS[1]

There are two general types of refrigerating systems, the compression and the absorption type. In the usual compression type a small compressor, operated by an electric motor, is used to compress the vapor coming from the refrigerating coils to a pressure sufficiently high to cause it to liquefy at ordinary temperatures, when heat is removed either by water or air. The liquid is then readmitted through an expansion valve or equivalent device to the refrigerating coils, where its evaporation at a low pressure produces the cooling for which the machine is designed.

In the absorption type the vapor from the refrigerating coils is absorbed in a suitable substance, such as water, or other liquid, or by a solid which is capable of absorbing large quantities of vapor. Subsequently the substance containing the absorbed vapor is heated, either electrically or by a gas flame, and the vapor is driven off, then cooled and condensed to a liquid, which is returned to the refrigerating coils. Machines of this type have few or no moving parts, practically all of them are almost noiseless in operation and, in contrast with many machines of the compression type, require connection to a water supply for cooling. Some of the machines using a liquid absorber are continuous in operation, the heat being applied always to one part, while the liquid is caused to circulate. Others are of the intermittent type, the heat being supplied for a time to one part, then to another part, or to one part at intervals. Nearly all of the machines now on the market are designed to provide for freezing ice cubes, and since this feature is so very generally included, no further consideration of it is required here.

A very large number of makes of refrigerating machines of the compression type have been put on the market. These have included such variations as direct drive, belt drive, and gear drive; reciprocating single or multiple cylinder compressors, various types of rotary compressors; various refrigerants such as sulphur dioxide, methyl chloride, ethyl chloride,

[1] From "Electric and Gas Refrigerators" (Letter Circ. 255; U.S. Dept. of Commerce, Bureau of Standards, 1929).

ammonia, volatile hydrocarbons, etc.; air or water cooling; refrigeration by direct expansion or by the use of brine tanks, etc. Completely self-contained and sealed machines of the compression type have also been made. It is impracticable to discuss here the various merits and demerits of the features which are often emphasized out of all proportion to their importance, in advertising and by salesmen. The user of a machine is not so much concerned with the kind of drive, refrigerant or absorbent used, type of compressor or system of refrigeration as he is in the kind of service the machine will give and what the service may cost over a period of years. For example, there is no outstanding advantage in a machine with a brine tank as compared with one of the direct expansion type, but the success or failure of either will depend upon the quality of the *whole* machine and not upon such a detail of design.

Knowledge of details of design of this kind is of value to the expert in judging whether the machine is designed and made so that it can be expected to have a reasonably long life and give satisfactory service during its life. The fact that a machine has one or several features of design which seem superior does not necessarily indicate that it will prove to be superior to other machines having other features of design. For example, the refrigerant used is a factor of minor importance as regards efficiency, since machines can be designed to use any of the ordinary refrigerants effectively. Similarly either compression or absorption machines can give very satisfactory service.

There have been instances where refrigerants which constituted a distinct hazard to life or health have been used, but this does not apply to the refrigerants now in general use. Again a poorly designed machine might introduce a distinct fire or accident hazard. The purchaser of a machine should, therefore, take into consideration evidence concerning test and approval of the type by some disinterested authority.

Short-time tests of refrigerating machines unfortunately furnish only incomplete information as to their relative merits. Such a test may disclose obvious defects and will readily show the power or gas and water consumption and the efficiency of the unit tested, when new. By operating the machine under extreme conditions, e.g., at high room temperature, it is possible to make an estimate of the margin of reserve in power, cooling capacity and strength of parts above ordinary requirements, but none of these tests gives information on the most important points, namely, the durability and reliability in service of the average machine under ordinary conditions.

Some of the factors to which the prospective purchaser of a machine should give attention are the following:

1. *Standing of the manufacturer.*—If the manufacturer does not remain in business the machine is likely to become obsolete in a very short time, since replacement of worn or defective parts may be difficult or impossible.

2. *Record of the machine.*—A machine in the experimental or development stage is a more speculative proposition than one which has stood the test of service.

3. *Noise.*—Unless a machine runs quietly when new and continues to do so, it will be unsatisfactory to most of its users.

4. *Useful life.*—The aggregate cost of refrigeration depends to a considerable extent upon the length of life of the machine, and upon the cost of service and repairs. Very little information on this point is available, and the purchaser must depend upon the reputation of the product and such information as he can find in regard to durability.

5. *Efficiency of the machine.*—There are considerable differences in the operating efficiencies of different machines, and figures on operating costs can sometimes be obtained. If a machine is not well made or is allowed to deteriorate, efficiency may be greatly reduced after a short period of use.

6. *Insulation of the refrigerator.*—The refrigerator should be well insulated, preferably with not less than a two-inch thickness of some good insulating material. Refrigerators depending largely upon air spaces for insulation or those with thin walls and doors are likely to require considerable power or fuel and water to keep them cold.

7. *Air or water cooling.*—If the machine is water cooled, the purchaser should determine that his water supply is suitable for the purpose, so that deposits from hard water will not be formed inside the machine, ultimately interfering with its functioning, and that the water supply is sufficient in quantity and not too expensive.

8. *Servicing of machine.*—Preference should be given to a machine which could be easily and inexpensively serviced or repaired when necessary. A machine which could easily be removed entirely and replaced by another would be classed as easily serviced. If attention such as oiling or adjustments are required from time to time, the points requiring attention should be few in number, and should be readily accessible where the machine is to be installed, lest it suffer from neglect.

9. *Quality of local service.*—A machine obtained from a responsible dealer, who is prepared to attend to adjustments and repairs promptly when required, is to be preferred.

10. *Comparison of refrigeration by machines and by ice.*—The purpose of this section is not to make an exhaustive comparison between machine refrigeration and ice refrigeration but merely to point out some of the more obvious facts, which, if kept in mind, may enable the prospective purchaser to avoid being puzzled or misled.

The owner of a refrigerating machine is free from whatever annoyance accompanies frequent or irregular delivery of ice. The machine can be set to maintain a lower temperature than is practicable with ice, so that left overs can be kept a somewhat longer time before being thrown away. Few subjects are more misunderstood by the public and by writers on refrigeration than that of temperatures required for proper refrigeration. Most writers draw a dead line at 50° F. and state, in effect, that useful refrigeration is not obtained above that temperature. The facts are, however, fairly simple and obvious. Time and temperature are equally essential factors in decay. Most foods will remain palatable and wholesome if kept as long as a day at a temperature as high as 60° F. If they are to be kept for a week, 50° F. may not be low enough. If they are to be kept for a month, the temperature must be still lower. In any case, most users prefer to serve food while it is fresh; there are very few who purchase a refrigerator for the purpose of establishing a miniature cold storage plant to preserve foods for considerable periods, and the possibility of keeping foods for more than a limited time is of little practical importance. There is, of course, a wide difference in the keeping qualities of various kinds of foods. The user of a machine is usually less subject to loss from spoilage of food, and in some cases there may be a considerable saving in this respect.

Either an ice-cooled refrigerator or a machine-cooled refrigerator tends to maintain a dry atmosphere in the food compartments and thus to dry out moist materials stored in them. The water from the melted ice carries off material in solution thereby removing causes of odors.

The relative cost of refrigeration with ice and with a machine depends very largely upon the useful life of the machine and the costs of repairs, replacements and service. To make a comparison of costs, it is necessary to estimate the probable life of the machine and then to estimate operating costs, and costs of repairs, service, etc., over this period. To these add the initial cost (including interest charges if desired) and divide the total by the number of years to find the aggregate cost of refrigeration per year. A similar estimate may be made for a refrigerator using ice. Such computations indicate that a machine should have a useful life of at least ten years in order that the cost of refrigeration by machine should not be

unduly high as compared with ice refrigeration. In many cases the operating costs of a machine are lower than the cost of ice for a refrigerator of comparable size, but this is rarely true of the aggregate cost of refrigeration, which means that the greater convenience and better service of machine refrigeration are obtained at somewhat higher cost.

In many cases the purchaser of a machine compares its operating costs for the first few months with those of his old refrigerator, which may have had but little insulation when new and is almost certainly no better after years of use. Such a comparison does not give a correct picture. It is true that the reluctance of makers of ice refrigerators, until recently, to use insulation, has been one of the important factors in popularizing the machines, which are usually installed in well insulated boxes. On the other hand, well-insulated refrigerators for ice are a comparatively recent development. As machines are usually set to maintain lower temperatures than are obtained in iced refrigerators, they require more insulation. The minimum requirement for any type of refrigerator is that the insulation shall be sufficient to prevent the deposition of moisture on the outside of the box, under all conditions in which it is to be used. Adequate insulation requires no secret formulas or knowledge not available to the public, but only the use of a sufficient thickness (not less than 2 inches) of a good insulating material, adequately protected from moisture. Recently, well-insulated refrigerators for ice have been obtainable, and when such are used, the public will have a better opportunity to compare refrigeration by ice, with refrigeration by machine, on their respective merits.

[NOTE.—A national safety code for all types of mechanical refrigerators has recently been approved by the American Standards Association. A technical committee representing over forty national organizations has been working on the code for years.]

ELECTRIC REFRIGERATION, REFRIGERANTS, AND THE CABINET[1]

BY G. E. MILLER

Electrical refrigeration for the home has made such rapid progress and has so much of merit that it is the subject of keen interest to progressive housekeepers. To those who wish to investigate further, the following general facts may be of assistance in the confusion of claim and counterclaim of zealous salesmen.

A complete apparatus or unit includes two essential parts, the ma-

[1] Adapted from "Electrical Refrigeration for the Home," *Journal of Home Economics*, June, 1926. (Revised for this publication.)

chine by which the "cold" is produced, and the cabinet or box in which the food is stored. These may be purchased and installed separately or combined. The character of both of these should be considered in choosing a refrigerator, as well as efficiency, price, and cost of operation and maintenance.

The machine.—Since it is extremely difficult for the layman to judge the technical points of a refrigerating machine, his best criterion is the reliability of the manufacturer and agent. Several manufacturers have been making and selling electric refrigerators for a number of years and their machines have proved commercially satisfactory. In buying a machine the purchaser should inquire how long the manufacturer has been in business, how many machines of the model under consideration have been sold, how long they have been in use, and how many are in use in the immediate vicinity or city; and he should examine into the facilities available for emergency service and maintenance work in case the machine needs attention. Ofttimes the reliability and business integrity of the local selling agent, his ability to render prompt service when needed—for example, on Sundays and holidays, as well as week days—will be of first importance in making a selection. . . . . The older, better-known machines are about on a par and of equal merit.

In the case of newer machines which have not been on the market long enough to meet the test of them, the manufacturer should be of such financial strength and business integrity as to leave no doubt of his ability to make good in marketing a new device.

Refrigerants.—The medium through which "cold" is produced within the cabinet is called the refrigerant. Usually this is some liquid which will not freeze except at a very low temperature and which, when driven by electric power through the cooling system of the machine, makes the moisture collect on the outside of the system in the form of ice crystals. The refrigerants most commonly used in household machines are sulphur dioxide, methyl chloride, and butane. The quantity used is small and, when the equipment is properly installed, will last indefinitely. These refrigerants are not explosive and are harmless.

The cabinet.—The necessity of a high-grade cabinet for proper preservation of food in the home is not generally appreciated. An examination of many homes will reveal from basement to attic a real discrimination in the selection of household furnishings and equipment. There is, however, almost universally one exception—the ice box. A knowledge of the basic requirements of refrigeration—of what is necessary to keep food

fit to eat in the home—is almost wholly lacking. How many people would be willing to pay as much for an ice box as for the family piano? Which is the more important to the happiness of the home?

Investigation has shown that a large percentage of boxes sold to-day through the usual channels of trade are wholly unfit for the preservation of food. Many have little or no effective heat-insulating material in their construction. In wooden boxes, the cabinet work is often poorly done, resulting in warped doors leaving large cracks around the edges, where the cold leaks out and the heat leaks in. The hardware, latches, and hinges are flimsy and of poor design, thus preventing a tight fit between door and jamb. Manufacturers of electrical refrigerating equipment were among the first to appreciate the necessity of high-grade construction and adequate insulation in cabinets, and have taken an advanced position by insisting on a high-quality product.

Formerly most boxes were made of wood, but many are now made of sheet metal instead. If the cabinet is of wood it is essential that this be "treated" so that it will not absorb moisture, shrink, or crack.

The interior lining may be of metal covered with porcelain enamel or similar protection against rust, and should be waterproof. Glass linings have been used successfully. The highest-grade cabinets use a glazed solid porcelain lining, similar to a solid porcelain bathtub. In large cabinets these linings are cast in two pieces and the joints cemented to make them waterproof. Such a lining is easily cleaned and from a sanitary point of view is unexcelled.

The feature of greatest importance in cabinet construction is the insulating material. Many years of experience in cold-storage plants have demonstrated that solid sheet cork is about the best and most satisfactory material for this purpose, though other insulating materials have been used successfully. Two inches of sheet cork will provide satisfactory insulation. The purchaser should insist on knowing what is between the inner and outer walls. A few coats of paint have often been used to cover a multitude of sins of omission.

. . . . The coldest point inside a refrigerator cabinet should be approximately 30° to 32° F. In hot weather the temperature of the air outside the cabinet frequently runs from 90° to 100° F. That is, the range of difference in temperature between the inside and outside of the cabinet is from 60° to 70° F., or about as much as between the inside and outside of the house in zero weather. Houses in cold climates have thick walls, are provided with double doors and windows, and are otherwise protected against cold.

Great quantities of heat are generated inside to make them comfortable. One would not expect to be warm or even comfortable in a summer cottage or tent in zero weather. About one million ice boxes are sold annually in this country. Thousands of them are of the "summer cottage" variety and many belong to the "tent" colony. Eating perishable food which has been stored for some time in one of these may result in one's not being especially comfortable.

An electrical refrigerating machine is occasionally installed with an old cabinet, but unless the cabinet is of the very highest quality of construction, this is, generally speaking, a mistake. It makes no difference whether a machine or ice is used in a poor box; the results as far as preservation of food is concerned are in either case ineffective. An electrical refrigerating machine has intelligence but no brains. It is automatic in operation and will try to keep the box cold, but if the box has not sufficient insulation to hold the cold, the machine will run too much of the time, thus increasing the cost of operating and shortening its useful life.

Suggestions for installation.—Where people own their homes, it is usually desirable to install the machine in the basement or some other out-of-the-way place where the sound and vibration will be less noticeable. The cabinet should preferably be placed in a refrigerator room or other separate unheated space. The kitchen is not a good location for a cabinet; in some climates the summer temperature there frequently rises to 90° or even 100° F.

For use in a rented dwelling it would seem desirable to buy the self contained units (machine installed within the cabinet) as these are not rigidly attached and may be moved like any piece of heavy furniture.

The electric connection to a domestic refrigerating machine is best made through a convenience outlet, as with washing-machines, vacuum cleaners, flat irons, and all household electrical appliances; it is, however, possible to connect through an ordinary lamp socket.

Cost of operation.—The average domestic refrigeration machines will consume approximately 50 kilowatt hours of electricity per month, taking the year through. Ordinarily, of course, more electricity will be used in warm summer weather than in the winter. In midsummer the consumption may reach 75 units or more per month. If the cabinet is installed in a kitchen, the seasonal variation in the use of electricity will not be so great, but the average for the year is likely to be higher. In a northern climate, with the cabinet installed in a separate, unheated room, the ma-

chine may not run at all for two months or more in midwinter. From the above data, anyone who knows the cost of electricity in his community can easily make a fair estimate of the cost of the electricity required to operate a machine.

Cost of maintenance.—The selling price usually includes the cost of servicing the equipment for a period ranging from three months to one year. Manufacturers' practices differ as to the period thus allowed. There are wide variations in maintenance costs between individual machines just as there are in any other mechanical equipment, but data from various parts of the United States indicate that after the free service period these should not average more than $5 a year.

Care of equipment.—An electrical refrigerator requires little attention on the part of the owner. Usually this amounts only to putting a few drops of oil in the motor bearings once a week during hot weather, less frequently in cold weather. Some machines are now put out with bearings guaranteed to operate a year without oiling; others are being put on the market which require no oiling whatever.

When an electrical refrigerating machine is in service and properly adjusted, it is continually freezing the moisture out of the air in the cabinet. This forms a deposit of frost or ice on the cooling element, which will continue to increase as long as the machine is in operation. Too great an accumulation of this frost or ice will prevent a free circulation of air over the cooling element, thus stopping proper refrigeration in the food storage compartments, and perhaps causing foul odors. To avoid this, the cooling element should be defrosted periodically. This operation requires only the opening of the electric switch which controls the supply of electricity to the motor, and allowing the machine thus to stand idle until the accumulated frost and ice melt off.

The interior of the cabinet should be periodically washed out as would be done in any ice box. The drains, however, do not clog up but need regular cleaning as where ice is used.

Electrical refrigerating devices for the household are automatic in their operation and when properly installed and adjusted should require no attention except oiling, defrosting, and cleaning indicated.

Temperatures maintained.—The temperature maintained within the cabinet of a good electric refrigerator depends entirely on the quality of insulation in the cabinet, the temperature of the air surrounding the cabinet, and the frequency with which the doors are opened.

Any of the well-known machines installed on a cabinet with good insulation will maintain satisfactory temperatures in the warmest part of the cabinet. The warmest point in the cabinet is the top of the food compartment and that should never be over 50° F. The coldest point is immediately under the cooling element and ranges from 30° to 35° F.

The working range of temperatures within the cabinet can, if desired, be changed either up or down by adjusting the thermostat, ...

THE GAS-FIRED REFRIGERATOR[1]

Let us first consider what refrigeration is. "Cold" is merely the absence of heat, and any means of absorbing heat which will lower the temperature to between 40 and 50° will give us the refrigeration we require in the home.

A piece of ice placed in the ice box absorbs heat by melting—changing from a solid to a liquid at a low temperature. Certain substances known as refrigerants, such as sulphur dioxide and ammonia, absorb heat by vaporizing—changing from a liquid to a gas—at a low temperature. If, then, we can permit this refrigerant to vaporize inside the chamber we wish to cool, and then change it back to a liquid outside of that chamber, we will have continuous refrigeration.

The electric machines accomplish this job by means of a compressor driven by an electric motor. The refrigerant is put under a high pressure in the compressor and it will then turn to a liquid at ordinary room temperatures. This liquid is then carried by a pipe to the freezing unit inside of the refrigerator, where the pressure is reduced by a valve. As the liquid refrigerant passes the valve it vaporizes, takes up heat in so doing, and cools the box. The refrigerant, which is now in the form of a gas, is returned to the compressor through another pipe and the circulating operation repeated.

The gas refrigerator makes use of a small boiler to raise the pressure of the refrigerant, so that it can be changed back to a liquid at ordinary temperatures. The major steps in the cycle of the gas-fired refrigerator are as follows:

Ammonia dissolved in water is placed in the boiler and heat, from a gas flame, applied. The ammonia is driven out of the water as a gas under pressure, and is then condensed to a liquid. The liquid flows to the freezing unit and is vaporized, taking up heat and cooling the box.

[1] Adapted from "How the Gas Refrigerator Works," *Domestic Engineering*, December, 1928.

The ammonia, now in the form of a gas, is absorbed again in cold water and flows back to the boiler.

At the present time the operating cost of the gas refrigerator is slightly higher than the electric, although less than the cost of ice. The gas refrigerator, however, has no moving parts, which means that few repairs will be necessary.

The "generator-absorber" contains "aqua-ammonia" (that is, water and ammonia). It is the same kind of solution known all over the world as "household ammonia" and familiar to every housekeeper. For our purpose the percentage of ammonia is greater.

A gas burner is located under the "generator-absorber." The heat from this burner causes the ammonia in the liquid to become vapor.

This vapor passes along to the "condenser," where it is cooled by circulating water. Under this treatment the vapor becomes liquid and flows down into the "receiver."

This process continues until a sufficient quantity of the ammonia has been "vaporized" out of the aqua-ammonia in the "generator-absorber."

The circulating water is then automatically discontinued in the condenser, and diverted to the cooling coil of the "generator-absorber," and the gas is automatically turned out.

When the "generator-absorber" has cooled down to a predetermined point of temperature, the liquid ammonia refrigerant commences to pass from the "receiver" through the expansion valve into the expansion coil.

This coil is located in the ice chamber of the refrigerator itself.

The evaporation of ammonia gas, from this liquid, draws the heat from the refrigerator and its contents.

Cold is merely the absence of heat. This process of drawing out the heat creates a perfectly dry cold atmosphere in the refrigerator.

The spent ammonia gas then passes back to the "generator-absorber"—(which first generated the gas, and again, when its work has been accomplished, re-absorbs it). Thus the whole process of refrigeration has been completed; matters stand where they were in the beginning. The "generator-absorber" is again in readiness to repeat the operation which is automatically done as often as is necessary to provide the refrigeration required.

ICE REFRIGERATION AND THE ICE CABINET[1]

By M. E. PENNINGTON
National Association of Ice Industries

While ice, for many years, has been an indispensable article in the good conduct of households, only recently has its efficient utilization received serious attention. Like the electric current and gas its benefits must be made apparent through suitable appliances.

The old "ice box" is being definitely superseded by the scientifically designed and constructed ice-cooled refrigerator in which are maintained the temperatures designated by bacteriologists and biochemists as necessary for the proper preservation in the home of milk, fresh meats, fruits, vegetables and the like. For example, the portion of the refrigerator receiving the current of air just off the ice is less than 45° F. even when atmospheric temperatures are continuously at 90° F. and the contiguous sections are well below 50° F. Particular attention has been paid to obtaining 45° F. or less for milk and delicate foods, since, more and more, we learn that 45° F. is, for them, the crucial temperature line. For most vegetables and fruits, however, temperatures from 50° F. to 55° F. are adequate for household needs.

The modern refrigerator for ice has abandoned the so called "dead air space" for insulation and has substituted from one to three inches of pure corkboard or its equivalent. It has properly adjusted openings for air circulation and a "baffle" between the ice compartment and the food compartment which guides the direction of the air movement.

There should be available a section of the wall of every refrigerator sold that the purchaser may see for herself (1) the thickness and kind of insulator, (2) the entire absence of so called "dead air spaces," (3) the presence, location and kind of waterproofing compound used to protect the insulation from moisture, (4) the reasonable use of paper to protect the surface of the insulator but not to be depended upon for insulation.

The primary requirements in choosing insulators for household refrigerators are (1) high resistance to the passage of heat and (2) high resistance to the absorption of moisture such as is exhibited by pure corkboard. The heat resistance of balsam wool, dry-zero, and to a lesser degree insulite, celotex, nu-wood, weatherwood, and flaxlinum, has permitted these materials to function in refrigerator walls when properly waterproofed. The

[1] Part of the following article has been adapted from *Buying a Refrigerator* (Household Refrigeration Bureau, National Association of Ice Industries, 1930), and the remainder has been prepared by Dr. Pennington for this publication.

less the resistance to heat, the thicker the layer of insulator must be. Therefore, the purchaser should insist upon knowing the name of the insulator and the thickness of it.

Regardless of other qualities, insulators used in refrigerators should be strong enough to stand up without support. This requirement places granulated cork, mineral wood, asbestos wool and similar substances in the category of the unreliable insulators for household refrigerators. Refrigerators containing them lose their efficiency too rapidly to be either reliable or economical. Balsam wool, dry-zero and flaxlinum are manufactured in panel form and, if properly protected against moisture absorption, the slabs wear well. In flexible blanket form they are, with our present methods of building, much less reliable.

Microscopic air spaces such as nature puts into corkboard are our most efficient insulators. But man cannot build such tiny, tight spaces into walls and what man terms "dead air spaces" soon become almost valueless in a household refrigerator. For example, a refrigerator with air space and paper in its walls melted 28 pounds of ice per day and gave a temperature in the top of the food compartment of 62.8° F. A similar refrigerator with two inches of good insulation under exactly the same conditions melted 25 pounds of ice per day and maintained a temperature of 51.9° F. on the top shelf.

Too often the "bargains" advertised at low prices, or the sales of refrigerators put on to attract customers, are based on air and paper cabinets without any real insulation. The salesmen have been known to justify their statements by quotations from government bulletins in which were set forth laboratory experiments but they were not applicable to refrigerators of which fact the salesmen may have been ignorant.

Of course, the initial cost of air and paper is much less than the cost of a good insulator. But such refrigerators, in spite of good icing, do not protect foods. They soon acquire wet walls, melt ice extravagantly and increase running costs beyond all reason.

Some refrigerator walls appear thick because some manufacturers have alternated air spaces with layers of insulation. Or, they have left a space next to the inside lining. Such walls will not wear well because they are not air tight and so water will condense in them even when both inside lining and outside sheathing are steel. When an insulator is wet—or even damp—heat can go through it easily. Protecting against water absorption is a difficult part of refrigerator construction.

Atmospheric air is sure to get into the walls and it always carries more

or less moisture which condenses when it penetrates to a cold part of the wall, especially the part near the inside lining since that is coldest. Therefore, a coating of some good water resisting compound, such as odorless asphalt, should be applied to all surfaces. If this asphalt binds the self-supporting insulator firmly to the interior lining on the one side and to the outer sheathing on the other, the insulator will be kept dry and stay in place for many years. Such construction, also, is an efficient way of eliminating air spaces. Because of the difficulty in applying hot asphalt to such surfaces, heavy paper impregnated with odorless asphalt is often used to cover or wrap the slab of insulation.

The lining of a refrigerator should be porcelain or vitreous porcelain on steel if the purchaser can afford it. At lower cost one can now obtain good white enamel-on-steel linings which wear well if well made.

Whether of porcelain or enamel, the inside lining should extend unbroken around the ends and back of the refrigerator and the top and bottom should be put on with well-made locked seams. The old type of L lining which necessitated separate fitted pieces for the lining of the ice compartment is undesirable and is rapidly being replaced by linings of the "one piece" type. The enamel metal linings have seams in them. It is the aim of the conscientious manufacturer to make these seams as air tight as possible and they are constantly improving their work.

The vitreous porcelain is truly in one piece and so is better able to protect the walls against moisture. The old-fashioned L type of porcelain lining is much less desirable than the continuous type now much used.

All corners should be rounded to facilitate cleaning. Formerly only porcelain could have rounded corners but now enameled linings have them.

The purchaser is especially interested in the openings to carry the air to and from the ice; in the construction of the baffle because of its influence on air circulation; and in the amount of food space. When buying, be sure that the refrigerator is up to date in these items.

Unless there is abundant and continuous circulation of air, the food will not be well kept. To obtain good air circulation we must have (1) the surface of the ice unobstructed, (2) a large opening for the air to escape from the ice compartment, (3) a guide to direct the cold air all the way down to the floor of the refrigerator and all the way up above the top shelf.

Since we must have an open, uncovered ice surface to most rapidly and efficiently absorb heat and food odors, it is obvious that appliances in

which the ice floats in water or is encased in metal over which the passing air is to be cooled decrease refrigerating efficiency.

Almost without exception those refrigerators so designed and constructed that they cool and deliver drinking water through a faucet have food compartment temperatures which are too high for the adequate protection of food. It is better to put drinking water into bottles, lightly stoppered, and set them into the well-iced refrigerator in the milk or food compartment.

In the middle of the floor of the ice compartment in the side icer refrigerator there should be an opening having an area at least one quarter of the total area. In refrigerators having from five to eight cubic feet of food space this cold air outlet is usually from six to eight inches wide and from 10 to 12 inches long. It is well, when selecting a refrigerator, to remove the ice rack and measure this opening because if it is too small, the refrigerator will not function properly. There should be a space between the ice rack and the walls of the ice compartment that the cold air may fall easily to the floor of the compartment and so through the hole. The surface of the ice rack should stand at least one and one half inches above the bottom of the ice compartment. Otherwise, the flow of air is cramped and, also, there is likely to be sweating of the surface of the metal ceiling of the milk compartment.

Thus will the air, cooled by passing over the surface of the ice which is never more than 32° F., find a ready exit into the space where the food is kept.

The next item to be sure of is that the air traverses completely the body of the refrigerator and cools every portion of it. A simple and efficient method of guiding the cold air is to extend upward and downward the partition which separates the ice compartment from the food compartment, and to put within this partition some insulator so that it is less cold than all metal would be.

Such an extension we call a "baffle" and for the best results it should reach to within five inches of the floor and six inches from the top of the refrigerator in cabinets of larger sizes. Then the air falling through the large cold air down drop must continue to fall until it sweeps the floor whereon stand the milk bottles and containers holding the most perishable foods. Then it rises quite evenly, because it is picking up heat as it goes, until it passes over the top of the baffle where there is plenty of space for it to travel easily, and so over the surface of the ice again. The baffle must be solid—that is, free from openings directly into the food compartment.

If such exist, the circulation of air *above the level* of the ice will be very sluggish and, consequently, the upper part of the refrigerator will be warm. While this defect may not be felt when the refrigerator is full of ice, it will be when the ice level falls.

We can easily see that the better the insulation and the better the workmanship, the more space, provided the design of the interior is correct, will a given amount of ice cool. From this knowledge we can properly reason that a refrigerator having an unduly large proportion of its interior space devoted to ice—such, for example, as 45 to 50 per cent—is not so economical a refrigerator nor, all other things being equal, so good a purchase as the refrigerator of the same total interior capacity which is properly cooled with 30 to 40 per cent of that space devoted to ice. Given a total capacity of 10 cu.ft., in the one case the housewife would have 6.5 cu. ft. for food space while, with the unduly large ice chamber, she would have but 5 to 5.5 cu. ft. for food.

Recently the United States Bureau of Standards fixed the minimum sizes of the door openings and the depth of the ice compartments,[1] when they are to accommodate 25, 50, 75, 100 and 150 pounds of ice, each quantity to be in a single piece and each to conform to the standard sizes for such weights.[2] The most progressive and reliable refrigerator manufacturers have adopted the recommendations of the Bureau of Standards so that the purchaser, armed with the knowledge, can properly insist upon being provided with such a refrigerator. Equipped when she goes to buy, with a tape measure or a foot rule, she can for herself measure the height, depth and width of the interior and so find the total cubic capacity. Then removing the ice rack, she can measure the height, width and depth of the ice compartment and so determine the proportion which its space bears to the whole. Of course, she will measure the door opening[3] to be sure it conforms to the Bureau of Standards requirements.

The standardized ice compartments have given the wide awake refrigerator manufacturer a chance to build systematized refrigerators where, with the same amount of space devoted to ice, better building and

[1] Dept. of Commerce, Bureau of Standards, Division of Simplified Practice, *Simplified Practice Recommendations R 109–29: Refrigerator Ice Compartments.*

[2] Dept. of Commerce, Bureau of Standards, Division of Simplified Practice, *Simplified Practice Recommendations R 96–28: Ice Cake Sizes.*

[3] Door openings in clear:

25 lb. 8″ by 12″	75 lb. 12″ by 20″	150 lb. 12″ by 24″
50 lb. 12″ by 16″	100 lb. 12″ by 23″	

better insulation will enable that ice to cool a greater and greater amount of food space, as well as give longer wear and a more pleasing appearance.

For example, when the walls of the properly-built refrigerator contain the equivalent of one inch of pure corkboard, 100 pounds of ice in a standard size ice compartment can refrigerate about five cu. ft. of food space. If the wall has the equivalent of one and one half inches of corkboard well installed, the 100 pounds of ice within the same ice compartment can cool from six to seven cu. ft. of food space. And when we have from two to three inches of pure corkboard insulation, the food space which 100 pounds of ice can cool is a minimum of eight cu. ft.

The foregoing illustration shows the application of the information obtained by scientists working on the principles of economical and efficient refrigerator construction, when the ice cut is constant. It applies in principle to the 75 and 50 pound cuts also.

Now let us see how the principle might apply if the purchaser had a definite idea in her mind of the amount of food space which her family required and wished to maintain the properly low temperatures necessary at a minimum expense for ice.

Should she need about five cu. ft. of refrigerated food space, she could obtain it in a cabinet in which the ice compartment is dimensioned to hold 100 pounds of ice. Then the ice compartment would occupy about 40 per cent of the total inside capacity. If, however, she selects a refrigerator having more insulation and better construction, she can have the five cu. ft. of space for food refrigerated with an ice compartment dimensioned for 75 pounds of ice. And with the very best of insulation and construction she will find that five cu. ft. of food space can be refrigerated satisfactorily by an ice compartment of 50 pounds' ice capacity as specified by the Bureau of Standards. The space required for 50 pounds of ice when added to the five feet of food space desired by the purchasing housewife gives a total interior volume of about 7.5 cu. ft. of which the ice occupies about 30 per cent of the total insulated space.

Let the thrifty housewife remember, also, that ice must melt to cool the ice compartment as well as the food compartment. But because no foodstuffs of any kind should ever be put into the ice compartment, there is no direct return for the ice unnecessarily melted to cool an ice compartment which is larger than it needs to be.

Chemists and bacteriologists working in their laboratories have ascertained that an average temperature not to exceed 45° F. in the milk compartment and not to exceed 50° F. in the food compartment is ade-

quate for the protection of foods in the home. These temperatures have been broadcast far and wide so that the housewife is now familiar with them and demands that her refrigerator gives them.

SUMMARY

The two general types of refrigerating systems are the compression and the absorption type. A large number of makes of compression-type machines are on the market. Most users are more interested in service, service cost, and machine cost than in refrigerants, kinds of drives, absorbents, or systems of refrigeration. Consideration by the purchaser of the following factors is important: (1) Standing of the manufacturer, (2) record of the machine, (3) noise, (4) length of life and cost of service and repairs, (5) efficiency, (6) insulation of the refrigerator, (7) air or water cooling, (8) servicing of the machine, (9) quality of local service, (10) comparison of refrigeration by machines and by ice.

In buying a machine it is best to depend upon a reliable manufacturer or agent. It is essential to have a high-grade cabinet as the preservation of food is of exceptional importance.

In selecting ice cabinets insulation is of great importance. Adequate insulation requires at least two inches of thickness of a good insulation material, adequately protected from moisture. The insulators should have high resistance to the passage of heat and high resistance to the absorption of moisture. For linings, porcelains or vitreous porcelains on steel are preferred. Less expensive linings are white enamel on steel linings. Openings should be sufficiently large to carry the air to and from the ice. The amount of food space and provision for air circulation is a consideration in buying. For good circulation: (1) The surface of the ice should be unobstructed. (2) There should be a large opening for the air to escape from the ice compartment. (3) There should be a guide to direct cold air. Refrigerators should have cold-air outlets sufficiently large for proper operation, and air should traverse all portions of the refrigerator.

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[1] Published by the National Association of Ice Industries, Chicago, Ill.

CHAPTER XI

WALL AND FLOOR FINISHES AND COVERINGS

1. The Various Kinds of Wall Finish

BACKGROUNDS[1]

By MRS. CHARLES BRADLEY SANDERS

Plain flat-tone[2] paints, tints, wallpapers and commercial wall oilcloths in a cloudy, allover[3] pattern make the best backgrounds. For rooms facing north, the best colors are the yellows, ranging from a cream color to a deep pumpkin yellow. For rooms facing south, use light grays, which might range to a deep putty color. In sunny rooms it is possible to use any colors except those which fade easily. On the walls of rooms with northern or eastern exposures, or a combination of both, use warm colors; southern and western exposures demand cool tones. In the rooms of uncertain exposure, for example where windows on the west conflict with windows on the east, use neutral tones, which are neither warm nor cool colors.

[NOTE: Although exposure doubtless is the most important factor which influences the choice of color, such considerations as size and shape of rooms, type and size of furniture, and individual preference also should be kept in mind.]

Warm Tones	Neutrals	Cool Tones
Red, light or dark	Ivory	Blues, light or dark
Rose, light or dark	Cream	Greens, light or dark
Pink, light or dark	Buff	Violets, light or dark
Brown, light or dark	Putty	Grays, light or dark
Orange, light or dark	Tan	Silver
Yellow, light or dark		
Gold		

The best way to treat adjoining rooms, with a wide doorway between, is to have the walls of both rooms alike, preferably in a neutral color, allover design paper, or plain flat-tone paint.

[1] From *How To Furnish the Small Home* (Better Homes in America, 1929).

[2] A flat-tone paint is a paint which contains more turpentine than oil and gives a velvety, smooth finish to walls.

[3] An allover design paper includes any of the mottled types or those showing a repetition of a small, close design which lends a soft, cloudy appearance to walls as background.

There are numerous types of finish for woodwork, such as paint, enamel, stain, waxed or a rubbed finish, and each, in turn, is in good taste, providing it is in harmony with either the furnishings or the wall decoration.

Where walls are lightly colored in either a paint or paper, it creates greater harmony to paint the trim white, cream, or ivory. These colors are suitable for Colonial houses, and are agreeable in living rooms, dining rooms and bedrooms. Dark woodwork and light walls are not usually in harmony, excepting in the case of all dark furniture; for example, if the furniture is dark mahogany or walnut, and the house is not strictly of a period, it would be permissible to have mahogany or walnut woodwork. If the furniture is dark oak, woodwork of the same wood and tone would be in harmony. Painting woodwork in any of the light tones creates harmony with light painted or papered walls, while finishing the wood in darker and natural tones makes a contrast, and should be used in connection with the more mellow-colored wall paints or papers.

Highly varnished light oak and pine woodwork is the most difficult and trying to make harmonize with either walls or furniture, and should not be considered. Mahogany, walnut, oak and all hardwoods should be finished with either oil, wax or varnish, and rubbed down and finished dull. This helps the woodwork to blend with the furniture and hangings.

FINISHES FOR ROUGH AND SMOOTH PLASTERED WALLS[1]

Color, tone, and texture are the elements of the background treatment. A familiar principle in their use is that the walls should be lighter than the floor and darker than the ceiling. This customary treatment reflects the out-of-door tonal relations of dark earth, lighter foliage, and luminous sky. But no rule-of-thumb can be applied to so variable a problem; in a high-ceiled room the proportions may appear favorably changed by darkening the ceiling several shades below the tone of the walls.

The color and tone of the walls, as well as being in harmonious relation to the furniture, should be chosen with reference to the exposure and size of the rooms, the warmer buffs and yellows being in favor for rooms with little sunlight, and lighter shades for small rooms than for spacious ones. Neutral shades, such as buff, ivory, and gray, are safe enough, and often form the most attractive possibility; but one should not rely too supinely upon the neutrals, because equally suitable and infinitely richer effects may be obtained through more original color-treatments.

[1] Adapted from *The House Beautiful Furnishing Annual, 1926* (Boston: Atlantic Monthly Co., 1926), pp. 12–15.

FIG. 49.—A rough-plaster finish requires few pictures or hangings for decorative purposes. Interior of Santa Barbara State Teacher's College practice house.

Of equal importance is the question of texture—will the effect sought in the room we are planning be best secured through a smooth painted wall, a rough plaster finish, the finer and less varied texture of wall paper, or the richness of a textile? In general, a rough texture or pronounced pattern on the wall diminishes the apparent size of a room. It absorbs the light and makes one more conscious of the nearness of the walls, just as a dark ceiling usually seems lower than a light one. An exception to this statement is found in the skilful use of old-fashioned landscape papers, which lend their distance and perspective to a small room. In general, tone and texture which often pass unnoticed—through lack of conspicuous qualities—tend to make the room seem larger than it would with a striking wall-treatment. It is well to realize the importance of these and other interlocking details which at first seem obvious and hardly worth mentioning, for they should all be given consideration in choosing the wall-treatment. Before making the final selection, the householder should know the possibilities which lie before him. . . . .

PLASTER WALLS AND PAINTED FINISHES[1]

Plaster walls may be varied by two means, texture and color, and with the possible variations of these two qualities many different effects are attainable. In many rooms the severity of plain plaster walls in neutral tone provides the most successful foil for tapestries or paintings of rich color, while some rooms which lack such distinctive decoration welcome the addition of more perceptible texture and color in the plaster. The modern use of rough plaster finishes, with soft color in plain or stippled effect, can be decorative and satisfactory, but it is easy to overdo unevenness. Moderation, here as elsewhere, is a wise rule. Moreover, where uneven finishes are used, the unevenness should not be mechanically regular. Avoid extremes in designing a finish of plaster or plaster-substitutes. To increase the soft and uneven effect of hand finishes, the corner-bead is sometimes omitted from the process of making the corners, and they are molded as squarely as may be by hand. This seems in pleasant scale with the roughness of the wall surface, but is more liable to chipping from careless treatment.

Whatever the texture and color of plaster walls, the contractor should be called upon for samples from which selection may be made before work is begun. Actual samples should be required of all wall treatments except

[1] For illustrations of plaster finishes and plaster glossary see *The House Beautiful Furnishing Annual, 1926*, pp. 15–16.

plain plaster. For color, a row of shingles, for example, painted the different shades under consideration and observed in the very room where the color is to be used—to see the true light-conditions, and so forth—

FIG. 50.—A smooth-plaster wall finish provides many opportunities for artistic results. (Photograph by Haskell. Living room of a house designed by Allen & Collens.)

will save much expense and energy. See for yourself. If you cannot be sure of your visual imagination, try an actual sample in the proposed environment. . . .

Color may be given to plaster walls in two ways: By adding dry color to the plaster before it is applied to the wall, or by painting or calcimining the finished wall. The first method has so far been less practicable than the second, as it requires experience to be sure of obtaining the color desired, and fading has been considered due to the "eating" of the color by the lime in the plaster. Modern materials and methods are removing this objection.

Wall paint.—The use of flat wall-paint—dull surface without gloss—on plaster walls is a practical finish which may be readily washed and kept clean. In most rooms it is preferable to any of the enamel-paint finishes, although in kitchen or bathroom a glossy enamel is clean-looking and easily cared for. As a background for pictures and hangings, in plain color, the mat surface of flat paint is the more harmonious. The degree of roughness of the wall surface, rather than the applied color, determines the texture in this case. By stippling—dabbling on the paint from the end of a coarse brush—a smooth wall may be given more texture, or a rough wall an appropriate finish; but this, like unevenness of the plaster, is a practice which should be followed in moderation. Avoid much contrast in the tones of color used; only a slight variation is pleasant. The same is true of the various other two-toned finishes by which smears of another color than the background are applied with wadded newspaper or similar vehicle.

For maintenance, painted walls on account of their washableness are usually preferable to a calcimined finish. Calcimine, however, is perhaps simpler to apply, and is less expensive in preliminary cost. It is often practical to calcimine new walls, then later, after a settling period of a year or two, to wash off the calcimine and apply the permanent treatment. This lowers the first cost without obtrusive economy. To patch either plain paint or calcimine is a difficult process, for which a perfect match in tone is requisite, and a light hand on the brush strokes. Calcimine—cold-water paint—is usually considered inexpensive enough to make an entire new coat more satisfactory than an attempt at patching. It is generally used in light tints, and always in plain colors.

Obviously, the roughness of a wall surface will govern to a certain extent its dust-catching proclivities. But this is not serious enough to alarm any housewife, considering the convenience of wall-brushes, with or without "vacuum" power. Another practical aspect of rough surfaces is their

scratchiness. For livableness, choose a finish which has no sharp particles adhering to it, although it may look comparatively rough.

Pargeting.—An attractive possibility in adding a decorative note to plaster walls in modern non-period rooms is the use of large figures, small patterns in relief, usually arranged unconventionally in the area to be decorated. This is an inheritance from old English work, and the designs in use are largely descendants of rather primitive and naïve Tudor animals, flowers, and so forth, but include as well more diffuse patterns of vines and scrolls. Special designs are adaptable for use in this way, the figures being usually cast first and imbedded in the plaster as it is applied, although in some of the old work the plasterer molded the figure as he spread the plaster. Originality in simple effects is attainable with pargeting, and although the informality of the spotting of the small figures may appeal to comparatively few people, the suggestions of ornamental relief may be carried out more conventionally. For instance, an over-mantel decoration in relief is most appropriate in rooms of Spanish as well as of classic inspiration, and gives a satisfying feeling of permanence and individuality.

Stenciling.—Another decoration appropriate to plaster walls is the application of color with a stencil pattern. The misuse of stenciling has given many of us unpleasant associations with it, which may easily be dispelled by a fair consideration of its possibilities. The importance of a design suitable to the mechanical limitations should be realized, as wide "ties"—the connecting links of the pattern which hold together the perforated design—in most stencils are much to blame for the frequently rudimentary effect of such work. Possibly some design in the upholstery or hangings of the room will provide a motif which can be adapted to its use as a stencil, permitting a judicious distribution of the ties and at the same time adding pleasantly to the decorative unity of the room.

The preparation of the pattern and its alignment for use, as well as the preparation and use of colors, demand both good workmanship and good materials. Border patterns are used in numerous ways: Around doors and windows, in decorative panels, or as horizontal borders in the room at any desired height. The majority of stencil patterns are bold enough to be applicable to plaster surfaces of rough texture, and gain in interest from the variation of background.

Wall-stenciling should be carefully designed to take its proper place in

the decorative scheme, and removable samples showing the proposed effect should always be passed upon in advance. An attractive, unobtrusive form of stenciling is done in flat paint and enamel paint of the same tone; with the pattern done in gloss on the dull background, an effect is wrought suggestive of damask.

OTHER TREATMENTS FOR SMOOTH PLASTERED WALLS

A decorative treatment may be given to smooth plaster walls by paneling. These panels may be made of wood or of plaster molding. Common picture molding often is used, and provides an inexpensive and effective treatment. The difficulty, however, in the laying-out of plaster walls into panels by the use of these moldings is in obtaining proper balance and proportion; for the room should be properly divided with consideration for doors and windows. For good results in paneling the plaster should be smooth. If it is not, a canvas usually is applied in order to hide cracks and other defects. This canvas is then sized. Generally, it is not considered advisable to panel a wall which has a number of openings as paneling in such a case would give the appearance of over-ornamentation. Consideration also should be given to each panel as a unit in itself, as well as its relation in size to other panels. Painting is usually advisable for a wall which has been paneled, and in accordance with other principles of decoration, the moldings and woodwork should be of the same tone, particularly in small rooms. Paneling is inexpensive and is commonly used in inexpensive houses, as it provides a satisfactory decorative wall treatment. The use of canvas is also effective in reconditioning as it hides shabby and worn plaster. If the plaster is too worn, it may be covered with plaster board and then paneled.

Antiquing which has been commonly used has not proved highly satisfactory. The results often are "dirty looking," and the walls do not have the desirable fresh and clean appearance. Antiquing is accomplished both with flat paint and with water color. A common method is to apply a second coat of transparent color over a first coat of flat paint, after the former has become dry. The second coat is then wiped off while still wet. The result is a two-toned effect. Another finish for plaster is a treatment which results in the appearance of natural wood.

PLASTIC PAINT[1]

BY JEANNETTE KILHAM

Plastic paint has the same surface appearance as the old cementitious materials and is just as permanent. It is, however, far easier to apply. Plastic paint will cover any surface that can be successfully painted and the same general principles which govern the application of paint apply also to plastic paint. Plastic paint, however, has this quality that it provides a uniform coating over a variety of different surfaces such as glass, cement, brick, etc., which makes it a boon in remodeling. It also covers wall board most successfully providing the joints are properly filled.

Surfaces which are to form backgrounds for objects bold in design and color can be richly coated with the material and broadly swept and smoothed with rhythmic sweeps of the trowel or a celluloid triangle, such as an architect uses. The artistry lies in emphasizing the strokes of the implement without placing them too self-consciously or automatically, the heavier the coat the rougher will be the resulting finish. Heavy, richly carved furniture and gorgeously colored textiles are enhanced by being placed against an effective background of this kind, which offers a subdued contrast of texture.

On the other hand, objects fragile in outlines and delicately tinted should be placed against a wall thinly coated with plastic paint and then slightly textured with the brush or stippled. Besides their attractiveness, lightly brushed and stippled textures are practical and economical, particularly where there are large areas to be covered.

If a one-coat finish is desired, color is added to the mix before it is applied to the wall. Best results are obtained by tinting with dry or fresco colors of the best grade, avoiding those colors which may fade in water mixes. The color should be broken down in water until it is the consistency of cream. It should be stirred first into a small portion of the plastic paint, which, in turn, is stirred with the whole mix. It is advisable to test the color by force-drying a small sample as some colors dry several shades lighter than they appear when wet.

Color for plastic-paint surfaces, however, is usually applied in a glaze which is washable. The surface is generally sized to kill suction and prepare the surface for the glazing. The glaze, contrary to the mix of plastic paint proper, is tinted with oil colors. Pigments that change should be

[1] Adapted from "Plastic Paint as a Background for Antiques," *Arts and Decoration*, February, 1930. Printed by courtesy of the *Arts and Decoration* magazine.

avoided. The glaze should appear over the sized plastic-paint surface as evenly as possible with an ordinary wall brush. It can be stippled to insure an even distribution and to help in blending the colors. It should be allowed to set a few minutes and then before it becomes tacky wiped evenly and carefully with a cloth rolled into a pad. The wiping removes some of the color from the projections of the texture, giving clear and distinct highlights, and leaves it in the depressions. The finished job results in a pleasing suggestion of light and shade—a subtle and very lovely two-toned effect though only one color has been used. Vari-colored finishes are produced by blending separately tinted mixes of glaze. If pastel shades are desired base colors should be toned down by using zinc white. . . . .

The wall finished with plastic paint is textured and colored by hand; it is a product of the craftsman and as such it is a natural and sympathetic accompaniment to the antiques and other art treasures. One can obtain almost any color effect desired by experimenting a bit with blending different tones. This, with the fact that plastic paint can be applied as readily over an old as over a new surface, makes it an extremely practical interior finish for general use.

[NOTE: To obtain artistic results from plastic paint the greatest of care should be exercised in its application.]

WALLPAPER AND FABRICATED MATERIALS

Wallpaper long has been known as a desirable wall covering. There are many excellent reproductions of Early American and Colonial papers available at moderate cost—printed in attractive color and combinations of color. Wallpaper panels—sections of interesting wallpaper design framed by moldings or borders—are used with good results. Brocades, velvets, and crewel patterns are recommended for paneled rooms. Mr. Matlack Price has discussed, briefly, fabricated wall materials and wallpaper in the following paragraphs taken from his article "Wall Treatment: Texture, Color and Design":[1]

Chief among fabricated materials, other than wallpapers, which add color and pattern to the interiors, is undoubtedly Sanitas, which of recent years has made a distinct advance in pattern design. Sanitas patterns compare more closely with wallpaper patterns, having abandoned an earlier tendency toward oilcloth, and in a material which, for certain purposes, serves better than wallpaper. If walls are in a bad condition, with old or new cracks, Sanitas, or its newer cousin, Wall-Tex, provides an ideal solution.

[1] In *Arts and Decoration*, July, 1930. Printed by courtesy of the *Arts and Decoration* magazine.

The makers of Sanitas have recently introduced a new wall covering called Metalline Brocade, a material in "period" patterns, with a lustrous, satin-like finish and delicate embossing. Here, certainly, are promising possibilities, when a wall covering can be devised to so closely approximate the effect of rich fabrics and at the same time be cleanable with a damp cloth.

The new material called Wall-Tex reminds us of the advantage enjoyed by any decorative product in which, all other things being equal, the element of

FIG. 51.—Wallpaper, plain or with a design, provides many effective wall finishes

design has been well and capably styled. Here are designs modern in feeling and technique, and suited in character to city apartment or country home. Quaint chintz patterns, too, provide for interiors that are English or Early American in feeling.

As to wallpaper, never before has it been in a stronger position in decorative favor than it is to-day. There was a time when wallpaper, failing to keep abreast of changing tendencies in decoration, came to be thought of as "old-fashioned." To-day, the situation is entirely different. Importations bring over the very latest in modern patterns from Europe, and our own designers are beginning to create unconventional patterns here.

Wallpaper, as a decorative resource, contributes to the interior pattern, color, and period characteristics, and with the present range offered, the perfect selec-

tion is entirely up to the decorator. What is more charming, for instance, in a Provençal French interior than a wallpaper reproduction of one of the old Toiles de Jouy? Or what more perfect for the Early American interior than one of the many reproductions of early wallpapers? Decorators have enriched wallpapered rooms by antiquing, which is a process that not only enhances the material but preserves it. For simple waterproofing, which will give a glazed effect, clear, transparent varnish is used over a first coat of glue size. After the paper has been given the protection of sizing and varnishing it may be antiqued by a third coat of much diluted orange shellac. At wallpaper stores there may be had a special preparation for antiquing, which produces exactly the degree of mellowing and brings out all the best qualities of the paper.

New decorative materials serve new decorative needs and trends, but it is safe to say that there will never be a substitute for wallpaper. Nothing will ever take its place, nor is anything likely to provide, within reasonable cost, such a versatile decorative resource. The range in wallpaper prices is almost as great as the range in styles, covering papers from sixty cents a roll to papers at three dollars and a half, and upward. The pictorial landscape papers come in sets, and are priced by the set rather than by the roll, with a range from twelve dollars for six-strip sets to seventy-five dollars, and more, for some of the imported sets.

Modern decoration calls for wallpaper patterns that are rather delicate in coloring and of a whimsical, often "sketchy" sort of design, departing definitely from the conventional. Many of these have the appearance of being free-hand quality that comes to us through an artist's direct work. The machine, at last, seems to have been conquered by the makers of modern wallpapers to a point where it does not mechanize a design and delete from it all spontaneity.

This, certainly, the modern movement seems in a way to give us. The machine, for years, had dominated design and made it a conventional unimaginative thing. Now, in the outstanding instances where authentic original design has come into the field of textiles and wallpapers, the machine has been put to work to interpret and realize, rather than suppress the designer's expression.

Wallpaper, however, like our other decorative resources, has not gone entirely modern. While it has shown a progressive spirit in the production of essentially modern designs, it has, by no means, discontinued its historic reproductions or its more conventional styles. There are still the highly stylized flock papers that rival in depth and texture the rich fabrics they reproduce, and there are still the quaint and charming floral papers that bring the colors and patterns of decorative chintzes into the room.

[NOTE.—*Wallpaper:* Excellent information on measuring rooms for paper, trimming, paste, and hanging, may be obtained from *The Paper Hangers' Manual.* Wallpaper Guild of America, 461 Eighth Ave., New York City. Pp. 32.]

NEW WALL FINISHES AND DECORATION[1]

By MATLACK PRICE

With all the variety of modern materials available for wall covering, choice among them rests entirely with the kind of house you have, or the kind of room, which may be anything from Elizabethan to ultra-modern.

To begin with the oldest materials, there are plaster, wood paneling and tiles; to proceed to the less old, there is wallpaper; and to proceed further, to more modern ideas, there are such materials as glass, vitrolite, sani-onyx and chromite.

If the house be Norman, Elizabethan, English cottage old or new, or if it be Spanish or Italian, plaster walls are preferred, perhaps with paneling in the Elizabethan house. Spanish or Italian types, moreover, and especially the former, are full of ideal opportunities to use decorative glazed tiles.

In houses of Colonial or Early American derivation, certain plaster finishes can be used, always wood paneling and always wallpaper. The modern in interior treatments is not so stylized by precedent: You can use any of these things, with the exception of wood paneling (which is "old fashioned") and you can use various new materials, such as glass, cork, or vitrolite.

Let us make a few specific notes.

First, there is plaster, with all its finishes, from semi-smooth to textures as rough as you please, and plaster, too, is modeled in decorative ceilings or in bas-relief incidents which may be built in. And for the formal interior, and especially for the foyer or hall, there is cast trouvertine, marked in the effect of ancient masonry.

A great deal of variety has been added to plasterwork by the development of colored plasters and by the ready availability, now, of really well-designed and well-cast mantles, placques, bas-reliefs and other decorative incidents. The makers of these casts now go to authentic sources for their models instead of putting out the very poor castings that tended to discredit the whole art of plastering. This, is, in fact, an art usually performed with a higher degree of appreciation by the Italian workman than by any other. He seems to have inherited some of the fine artistry and craftsmanship of Renaissance Italy.

With good, sound plasterwork as a base, there appears to be, at the

[1] Adapted from "The Walls of Your Home," *Arts and Decoration*, March, 1930. Printed by courtesy of *Arts and Decoration* magazine.

present time, a revived popularity for decorative glazed tiles, which are to be had in a wide range of good colors and pleasing patterns.

Tiles have been welcomed with joy by lay decorators who do unconventional modern decoration, because there is no limit to the colors or arrangements possible. Being small units, tiles are particularly adaptable to whatever scheme the decorator wants to execute.

Nor are tiles the only wall material. Vitrolite and opaque glass are constantly revealing new possibilities. Combined with built-in mirrors and colored plumbing fixtures, here are unthought of possibilities. Even the ceiling is now "glazed" with slabs of these materials, and it is doubtful if anything more sophisticated, more decoratively exotic, than black glass has ever been utilized by decorators. Combined with mirrors, and with one other color, such as jade green or coral, black glass has an incomparable depth and richness.

Orchid, grey, gold, amber—here are colors to conjure with, and the new bath-dressing-rooms, designed in the new wall materials, are like nothing that has ever been attempted before, except in a few isolated instances.

Color ranges that include jade and sapphire and turquoise—shapes of all kinds—patterns from odd floral motifs to quaint animals and figures, or a grand Spanish galleon sailing over a singing blue sea—what materials for any decorator to work with!

All these tiles are not of baked clay: Some are of new and special materials, such as sani-onyx, which is a vitreous substance, or chromite, smooth, flint-hard material that is cemented to the wall in sheet form. Each offers practical as well as esthetic advantages; we are living in an age of new materials which are revolutionizing interior decoration. We are offered new textures, new colors, new possibilities of building color into our houses in permanent form.

Nor does modern departure end here. Some vibrant effects have been obtained in sheet metal and leather. The new decorators, to whom precedent is only another term for anathema, have argued that, if tiles, sometimes a floor material, may be used for walls, why not use cork tiles, normally a floor material, for walls? Cork has, indeed, much to offer for unusual walls. Rich and mellow in its natural color, deeper still when waxed; soft and interesting in texture, it is also an absorber and deadener of sound.

The moderns have looked at various woods, too, and seen in them pos-

sibilities that have nothing to do with our old ideas of wood rooms, which were paneled. They have seen figure as wood's chief claim to decorative value, and are using it in great, flat, unpaneled expanses. . . . .

PANELED WALLS OF WOOD[1]

By H. VANDERVOORT WALSH
Professor of Architecture, Columbia University

One of the basic principles in all the arts is that any composition must have unity; that is, the parts must seem to belong together to form one thing. A building may be unified by virtue of being one unit, as for example a small house of rectangular shape, covered with a simple gable roof. But, if we go beyond one part and have a number, it is essential that we produce unity by making one central part much more important than the others. A house consisting of a number of extensions should be so designed that these additions are made less high and bulky than the main body of the house.

Now the same is true with the interior of the home. A sense of unity must be produced by the room arrangement inside. The living room should be bigger, have a higher ceiling and be more elegantly treated than any other room, so that it may dominate the plan and give a sense of unity to the house. This is important in the small house.

There are a number of ways of doing this. The length and width of the living room may be made quite large, by contrast to the other rooms. The ceiling may be made higher by not covering the floor beams with plaster, increasing their thickness, separating them further apart than usual and so letting the flooring on top of them serve as the ceiling. If one can afford it, the living room which extends up two stories in height is most effective. This however is an uneconomical thing to do in a small house. But there is another way of giving importance to the living room which is neglected in the American home. It is to cover the walls with wood paneling and have exposed wooden beams on the ceiling.

A living room which is decorated in this manner seems to be, if it is properly done, more homelike, than one decorated in any other way. There is a sense of warmth and intimacy about walls of wood. The rich colors and the variations of texture produced by the grain lend an air of dignity. . . . . Not only do the panels seem warmer, but they actually are, especially if one coat of plaster has been put on before they are applied.

[1] Adapted from "Paneled Walls of Wood for the Small Home," *Small Home*, May, 1929.

Without effort, a living room decorated with wood paneling dominates the plan and produces that unity which is necessary in any artistic composition. It becomes the center of the family life, and the members gravitate to it without effort. It is not like so many living rooms which are vacant, except when company comes.

Often, home-owners, although realizing all of these qualities, hesitate to have wood-paneled rooms, fearing the cost will be prohibitive. This fear

Fig. 52.—Paneling with wood is an effective wall treatment, and it requires less wall decoration. (Photograph by Mattie Edwards Hewitt.)

is usually well founded, for wood paneling as installed in the homes of the wealthy and designed after the finest of Tudor or French traditions is work for a cabinetmaker. Yet it is possible to select types of paneling that are beautiful, and which can be put on by the ordinary carpenter, at a reasonable price.

Old English cottages offer some suggestions as to the methods of paneling that are simple enough for any carpenter to make. One method, which is quite effective, reveals appreciations of light and shade which the

old carpenters had. Vertical boards were laid up so that every other one was forward of those on either side of it, by about one half the thickness of the board. This was done by having tongues along each edge of half of the boards and grooves along the edges of the other half. By fitting the boards together in this staggered fashion, a feeling of thickness and variety of shade resulted. Other similar methods were used in early times.

In our own Colonial period there were similar wooden partitions constructed, but they were slightly more elaborate. Boards about 18″ wide were cut to make a lap joint at the edges, and then ornamented by an interesting molding to hide the joint. Sometimes a molding was also run down the middle of the board to resemble the joint molding, and make the board seem narrower. To-day, if we could get a board as wide as 18″, we would be so proud of it, that we would think it a sacrilege to make it seem like two narrower boards.

We can easily sheathe our walls, to-day, with this type of wood finish. Boards of pine, redwood, Douglas fir and yellow pine, or cypress are very well suited to this type of decoration. An ordinary carpenter can do the work too. In finishing this boarding, wax rubbed into the wood and slightly colored with burnt umber brings out the warmth of the wood and makes a somewhat dull finish in harmony with the simplicity and crudeness of this kind of wood wainscoting.

Ornamental effects, something like carving, can be obtained with the sand-blasting method, at very little additional expense. Designs can be made to stand out on the board by shielding selected surfaces of the wood from the eating action of the sand. Patterns of the design are cut from manila paper and pasted on the board, so that the portion of the wood under the paper is shielded against the corroding action of the sand blast. When the process is completed and the paper removed, the ornament will seem to be raised from the surface. Additional effects can be obtained by staining the patterns. Redwood is particularly attractive when treated in this manner.

Of course it will be next to impossible to secure boards as wide as 18″, as did our Colonial fathers, but even if it were, they would split under the action of our steam heat in the winter months. However, broad and fine surfaces of wood can be obtained, even more beautiful in grain than ordinary boards, by using plywood. This is a wood board, constructed of three layers of thin veneer. The interior layer has its grain at right angles to the exterior layers. These veneers are glued together under

great pressure and are more durable than real boards. Widths of four and five feet are possible which do not crack under the drying action of steam heat. As the exterior veneer is especially selected for its richness of grain, some charming effects are possible. Nearly all of our native woods are made up into these plywood boards, and they are quite reasonable in price. Indeed, not only is the cost low but it is a better type of construction than solid boards. Panels made from plywood will not warp or crack so easily.

From the earliest times, carpenters have realized that wood swells in moist weather and shrinks in dry weather and that nothing can prevent this action. This movement of wood is more pronounced across the grain than in its length. A wide board will shrink and swell in its width a good deal, but very little in its length. Knowing this, carpenters and cabinet-makers have developed a method of building panels which has not changed much even in these days of new things. Narrow boards, two and three inches wide, are used to build a frame for the panels of wood. If a room is to be covered with panels, these framing boards, if horizontal, are called rails and if vertical are called styles or muntins. Along their edges are cut grooves into which the edges of the panels can be fitted. Thus the panel boards are held in place but are free to shrink and swell.

In English paneling the rails and muntins were made about two and three quarters of an inch wide. The edges were cut with a rebate so that the panels slipped behind them. In cross section they were something like a T with a very wide stem and narrow cross bar. Some rails, however, were made like an H in cross section and the edges of the panels were fitted into the slots.

The proportions of the panels were quite well established. The width was to the height as 3 is to 5. Usual dimensions in inches were 12″ wide and 20″ high. The horizontal rails were usually continuous strips and the muntins were cut into short lengths and fitted in between the rails. Moldings were cut along the edges of the muntins, and a molding added at the top of the panel under the rail to match and miter at the corners. No molding was carried along the bottom of the panel, but the upper edge of the rail was chamfered. The panel itself was about one inch thick and decorated with carving. The design which was most in vogue was the so called linenfold.

Now to build paneling of this type to-day is a cabinetmaker's job and the cost is rather great. However, there is a way of constructing it so that it has much the same character, but is very much less difficult to build,

and is therefore more in keeping with the economies which must be practiced in the small house.

This is the way to do it. First cover the studding with gypsum boards or lath and one coat of rough plaster to serve as a fire stop behind the wood paneling. The position of the various muntins and rails in relation to the openings in the room must, of course, be laid off in a drawing. To maintain good character, the size of the panels should be as near to 12″ wide to 20″ high as possible.

Use plywood, veneered on one side with oak, in lengths which will go roughly from floor to ceiling. Paint the back with linseed oil before setting in place to retard the penetration of dampness. Nail all joints in a position where they will be behind rails or muntins. This of course is also true of the position of nail heads. On top of the walls thus sheathed with plywood, nail the horizontal rails, consisting of plain oak boards $2\frac{1}{4}''$ wide by $\frac{3}{4}''$ thick. The short lengths of vertical muntins can also be nailed on. Then apply along the edges of the rails and muntins, mitering at the corners, an oak molding having the right character of profile.

It is best not to nail these moldings or rails too firmly together for the first year, for as the house settles, some stresses will be set up in this paneling, and if free to move a little, the wood will not split. After the first year, more nails can be driven in. Counter sink these nails where they show and fill up the holes with plastic wood compound.

The effect of wood paneling of this type is very pleasing, besides being very much cheaper to build than real paneling. If it is stained slightly, and the middle of the panels rubbed with steel wool to lighten up the stain and add a high-light and then wax applied, a very rich room decoration will result.

An even less expensive paneled effect can be secured by using plywood of Douglas fir and styles of the same wood. The graining of the fir is very beautiful for the veneers are taken from the out layer of the tree and since the logs are so great, and the cut is almost parallel to the annual ring of the new growth all the irregularities of the new growth produce a curling, twisting grain of great interest. This wood paneling will look best if no stain is applied. A stain will accentuate the grain so much that it will give the room a restless feeling. The unstained wood, finished with a little wax, in which burnt umber has been added, will be quieter and more cheerful. As the general tone is amber color, the room will not be as dark and heavy as one paneled with oak.

For a living room 13′x22′ and 8′ high, the materials for paneling of this

type cost about $85. The labor of applying will be about as much again. The same paneling done in the real manner would cost in the neighborhood of $1,000. . . . .

WOODWORK FINISHES[1]

For unity's sake in the modern house where the rooms may so easily be thrown together by the use of the ever charming French doors, or open doorways, the woodwork in all the rooms on each floor, especially in the main living rooms, usually should be finished alike. The necessary variety can then be introduced in the wall finish. Of course if one plans to give each room a distinctly different character the woodwork should be finished accordingly, but the surest and simplest method, unless one is an artist, is to finish the woodwork in all the rooms on each floor alike. All built-in features, bookcases, buffets or window seats should be finished in the same manner.

The usual finishes for woodwork may be divided into two main types: Natural and painted or enameled. By the first the native beauty of the wood is strengthened and brought out by the use of transparent finishes: Stain and varnish; or stain, shellac and wax. By the second the surface of the wood is entirely covered.

Because all woods do not take the same finish equally well, in planning a house the choice of wood finish desired should determine the choice of material for the wood trim. Soft woods like whitewood or poplar do not take the natural finish well. Cypress or birch cost very little more and take stain very well. Other good woods for natural finish are oak, gumwood, and spruce. Pine varies greatly, usually it is better painted.

It always seems a pity, sometimes almost a desecration, to paint beautiful hardwood, especially oak.

WOODWORK IN THE NATURAL FINISH

At present this method of finishing is somewhat in disrepute because of the very natural reaction from the orgy of "golden oak" and artificially grained woodwork of the past era in decoration. The trouble, however, is not with the finish, but because it was not properly done. There is nothing more beautiful than properly finished rich dark woodwork, particularly for the main rooms of the house. Especially if the walls are paneled this finish has a richness, an elegance, and a dignity not equalled by any other.

[1] Adapted from *Decorative and Practical Treatments for Woodwork and Walls*. Good Housekeeping Institute, 1926.

Improperly done, however, it has no claims to beauty. Many people hesitate to use wood paneling because of the expense, when in fact this finish has many claims for real economy on the score of durability and permanence. From the housewife's point of view the dark natural finish rates high, as it is undoubtedly very easy to care for. The artificial graining of soft woods to represent hard woods is an imitation that should not be tolerated. The need of simple honesty in the construction and finish of our homes to-day cannot be emphasized too often.

FIG. 53.—A wall finish of acid-stained redwood

STAINING AND FINISHING

The quality and grain of the wood should be enriched and strengthened by staining. This is most important as there is not always the proper depth to the natural wood color. Very interesting effects can be worked out on open grain woods such as oak, cypress or birch by the use of a paste filler in connection with the stain. The purpose of the filler is not only to fill up the open pores of the wood but to bring out the pattern of the grain in a tone either slightly darker or lighter than the stain. In this way the natural beauty of the wood is enhanced. The final finish after the stain may be shellac and wax; or dull varnish. The steps in the proper finishing of natural woodwork are:

A priming coat of raw linseed oil and turpentine stain of color required.

When dry follow with careful sandpapering with the grain with No. oo sandpaper.

Coat of white shellac.

Paste wax rubbed in, or

After stain, two coats of interior varnish, preferably dull finish.

Varnish should be lightly rubbed with No. oo sandpaper between coats.

The cost of labor and materials to-day makes it quite expensive to finish natural woodwork properly. In the attempt to economize many short cuts have been devised, most of which, while reducing cost, reduce quality also. Some specifications call for only two coats—the first of stain and filler, the second a flat drying varnish. These methods are rarely satisfactory.

PAINTED AND ENAMELED WOODWORK

By this method the surface of the wood is entirely concealed. Enamel is better than paint for the purpose, as by its use a new surface is built up coat by coat. The success of the final work depends upon the carefulness with which the undercoats have been applied. No directions need be given here as each manufacturer has worked out the necessary steps for his product. For first class enameling, not less than five coats should be given. If soft wood has been used for the trim it should be painted. Light woodwork will brighten dark rooms. With painted woodwork it is possible to achieve perfect harmony between walls and woodwork because of the wide variety of tints and shades possible. In some very beautiful houses the walls and woodwork are painted the same color. Light woodwork, especially where there are small children, does require much cleaning, a factor to be considered by the housewife who does her own work.

CHOICE OF COLOR

For some time white was most favored, but now the range of choice has widened to include ivory, tan, sand, putty, and many tones of gray. Unconsciously white surfaces are often a strain on both eyes and nerves, a good reason for using other colors for interior finishing. The practice among the best decorators at present is to paint all the woodwork, including doors, the same color as the walls.[1] Where the wall is papered, however, this is not always possible. Where the paper has a white or cream

[1] Good effects may be obtained, however, by painting woodwork a shade darker than the walls, particularly where light colors are used for wall finishes.

ground, cream is the best choice for the woodwork. With gray paper paint the woodwork to match, though sometimes white would have an enlivening effect. Where the color is rather intense, as, say, a blue papered wall of rather a heavy color, the woodwork would be better cream than pure white, as white makes a very strong contrast.

Tan, sand and putty, by their very neutrality, are delightful colors, and on the score of cleaning effect a compromise between light woodwork and dark.

Blue, green, yellow, or blue-green are sometimes permissible with ivory walls for the sunroom, or an informal breakfast room and for some bedrooms. . . . .

COLOR IN WOODWORK

. . . . A little experimenting along the lines suggested will open up infinite possibilities of variation in the use of color for woodwork. Generally a neutral and not a dominant tone should be selected for the large surfaces of the wood trim. Touches and accents of color, in the way of linings and stripings in the moldings, may be employed in the more informal rooms, the bedrooms, the breakfast room and the sunroom. In fact, in the finishing of these rooms it is quite permissible to vary our principle of finishing all the woodwork on each floor alike and if desired the wood trim of each room may be done in a different hue according to the color scheme being carried out.

FACTORS TO CONSIDER BEFORE CHOOSING WALL COLOR[1]

Exposure and number of windows.—In south rooms which have many windows and are sunshiny and light, cool colors, grayed in intensity and medium in value, may be used to soften the light.

North rooms, or rooms with few windows, usually need light, warm colors. Grayed colors with yellow in them will give cheer and light to these rooms.

Uses of the room.—Since the living room is the room which must be shared by a number of people and is the most impersonal room in the home, inconspicuous wall color will give the most restful background.

The dining room is used only for short periods at a time and the wall should not be quite so grayed in intensity as the living room.

[1] From *The Background of the Room.* Extension Bull. 93. Michigan State College, 1929.

The purpose of the bedroom is rest; therefore, the colors of the wall should be light in value and grayed in intensity.

Light colors are suitable for the bathroom. They give the appearance of cleanliness.

For the kitchen, wall colors light in value and less grayed in intensity than in the living room, may be used.

Size of the room.—If the rooms are small yet comfortably lighted, colors light in value for the walls will give the appearance of greater size.

If rooms are too large, warm colors of medium value give a friendly feeling to the room. If the value is too dark when cool colors are used the effect will be one of gloom and coldness.

Design of furniture, and main color of furnishings.—If the lines of the furniture and the proportions of it are good the furniture will be emphasized by a wall color grayed in intensity and light of value. If the furniture is not particularly interesting, and there are too many pieces, it will be less noticeable against a wall nearer its own value. The wall color should harmonize with the main color in the furnishings. It is well to have the walls repeat, in a grayed intensity, some of the dominant hue of the room.

THE APPROXIMATE REFLECTION OF LIGHT FROM THE VARIOUS COLORS[1]

	Per Cent of Light Reflected
Yellow	80
Orange	50
Green	42
Red	35
Blue	30
Violet	25
Grey	50

Light is reflected approximately as follows from certain colors in rather general use:

	Per Cent		Per Cent
Ivory	76	Forest green	21
Ivory tan	71	Olive green	14
Buff	60	Sky blue	36
Tan	37	Shell pink	57
Coconut brown	21	Dark oak	21
High light sage green	67	Mahogany	13
Low light sage green	43		

[NOTE.—For additional information on color see pp. 433–34.]

[1] From *Illinois Home Economics Handbook.* University of Illinois, 1923.

2. Floor Finishes and Coverings

FLOOR FINISHES[1]

New wood floors may be finished in a variety of ways, depending partly on the kind of wood and partly on individual preference. Wood finishers themselves often disagree about the best method of treating floors, but all agree that it is economy to use the best materials. The present tendency, for hardwood floors particularly, is to keep the natural color of the wood and at the same time give it a smooth, durable finish that can be cleaned and renewed with the minimum of effort. Though darker-colored floors generally give the best effects, light-colored floors have the advantage of showing dust and footprints less readily.

Stain, filler, oil, paint, varnish, shellac, and wax, or a combination of two or more of these materials, may be used. Oak and maple floors, for example, are often finished with a colorless filler, white shellac, and light-colored wax or pale varnish, a treatment that preserves the natural color of the wood with little change. A somewhat golden tone can be obtained by using orange shellac or dark varnish.

Before any finish is applied, the floor should be made smooth by planing and sandpapering parallel with the grain of the wood, and then swept and dusted with a soft cloth. . . . .

STAINING

Stains are used on floors to bring out the grain of the wood, or to make them harmonize in color with other woodwork or with furnishings, or to give certain softwoods tones similar to hardwoods.

Oil and water stains, so called because of the solvent used, are the common kinds. Oil stains are easy to apply evenly and do not raise the grain of the wood, but they do not penetrate very deeply and are likely to give a muddy effect. Water stains, on the other hand, soak in readily, give a clear color, and are cheaper than oil stains, but raise the grain of the wood so that sandpapering a second time may be necessary. Water stains may be used on either hardwoods or softwoods, but as a rule oil stains are not so successful on hardwoods.

Both water and oil stains may be bought ready mixed, or some of the simple ones can be made at home. In any case, before using, the stain should be tested on an inconspicuous part of the floor or on a sample of the same kind of wood. If the color is too intense, the stain should be

[1] Adapted from *Floors and Floor Coverings.* Farmers' Bull. 1219. Bureau of Home Economics, U.S. Department of Agriculture, 1921. For formulas for making stains, varnish and varnish remover, and wax see *ibid.*

diluted with the kind of solvent with which it is mixed or with other suitable liquid. For example, an oil stain may be diluted with turpentine, and a water stain with water.

If an oak floor is to be water-stained, coating it first with clear water and sandpapering it smooth after it is dry will lessen the tendency of the stain to raise the grain of the wood. Oil stains will be absorbed more evenly by pine or maple floors if the wood is first coated with a mixture of 3 parts turpentine and 1 part linseed oil and the surface sandpapered smooth after it is dry.

Stains should be applied rather thinly with a clean brush or a sponge with even strokes taken parallel with the grain of the wood. With water stains especially, care should be taken not to let the strokes overlap, and the stained surface should be wiped at once with a soft cloth or cotton waste. Oil stains should be allowed to set for a few minutes before the surface is wiped. Two coats of light stain generally give a better effect than one coat of heavy stain. In general, 1 gallon of oil stain will coat about 400 square feet of floor once, depending, of course, on the depth of color desired and the texture of the wood.

After a floor is stained, it should be allowed to dry for at least 24 hours, and dust kept from it as much as possible. When thoroughly dry, it should be polished with a weighted brush covered with carpet, after which it is ready for the filler and wax or varnish.

Some of the very porous woods may be filled and stained at the same time by combining the stain and the filler, but generally a better effect is obtained by applying them separately.

FILLING

Porous woods, such as oak and ash, take a smoother and more durable finish if a good paste filler is rubbed into them before the varnish, wax, or shellac is applied. Maple, pine, and other nonporous woods do not need such treatment and in fact will not absorb some kinds of fillers.

The best paste fillers are made of silex (silica), linseed oil, turpentine, japan, and coloring matter to match the wood. Cornstarch and whiting are also used as the base of paste fillers, but are less transparent than silex and can not be worked into the pores of the wood so thoroughly. They are generally used in homemade fillers, however, for silex is difficult to obtain in the retail trade. Oil has a tendency to darken wood, so it is sometimes omitted from the filler if a very light finish is desired.

A filler should be about the consistency of varnish when applied. If too thick, it can be thinned with turpentine for use on natural-colored woods, or with boiled linseed oil on stained woods. After the floor has been dusted, the filler is generously applied lengthwise of the grain with a clean stiff brush. This coating is allowed to set for 15 or 20 minutes, or until it turns gray, and is then rubbed in with cotton waste or burlap crosswise, not lengthwise, of the grain. A coarser material will drag the filler out of the pores instead of forcing it in. Several days later the floor is rubbed smooth with No. 0 sandpaper slightly dampened on the back. Ordinary oak will take up about 5 pounds of filler to 250 square feet of floor. If a very high polish is desired, a second coat of filler containing less oil and more turpentine may be applied and rubbed down as in the first case.

Liquid fillers are sometimes used on close-grained woods to fill up the pores and prevent the absorption of the more expensive varnish. A pure shellac varnish made by dissolving gum shellac in alcohol is recommended by some authorities for this purpose. The ready-mixed liquid fillers, which are brushed on and permitted to remain on the surface without being rubbed off, are in many cases little better than cheap varnishes.

VARNISHING

Varnish gives floors a hard, smooth, glossy finish, and is easy to apply and to clean. Under hard usage, however, it is likely to wear off, leaving patches of bare wood that remain unsightly even after revarnishing. Successive coats tend to darken the floor. Varnish is a common finish for softwood floors, but wax is preferred by many for hardwood.

Manufacturers have tested and put on the market an assortment of varnishes adapted to special uses, and it is often better to buy one of these ready-made standard floor varnishes than to attempt to mix one at home.

Varnishes are roughly classified into two groups, spirit and oil. The spirit varnishes are made by dissolving a resinous substance, such as gum shellac, in alcohol or some other volatile liquid. They dry quickly, leaving a hard, brittle coating on the wood, and, with the exception of shellac varnish, are not commonly used on floors.

Successive coats of shellac varnish well rubbed down may be used alone on a floor, or one coat may be used as a surfacer on a paste-filled hardwood floor that is to be waxed. For the first coat, 1 gallon of shellac will cover 300 to 400 square feet of floor, and additional coats will of course require less. Parquetry floors are generally shellacked in order to preserve the light color of the wood.

The oil varnishes contain resinous gum, oil, and driers, carefully heated and blended so as to bring out certain properties. Most of the floor varnishes are of this type and of the kind known in trade as "medium oil." They dry more slowly than the spirit varnishes, but have luster, hardness, and greater durability. Spar varnishes belong to the kind known as "long-oil" and contain an even larger proportion of oil, which makes them more durable and impervious to water. They are sometimes used on kitchen and bathroom floors, where those characteristics are of particular importance.

The first rule of varnishing is to have the surface of the wood and the air in the room as free from dust as possible and to use only scrupulously clean brushes. Varnish brushes are chisel shaped or slightly tapering; a rather wide one will be most convenient for this work. The varnish should be brushed on lengthwise of the grain in a smooth, thin coat without laps or brush marks and allowed to dry for at least two days. If possible, the temperature of the room should be 70° F. or higher and the varnish should be applied in the morning, for it dries better during daylight. When the first coat is thoroughly dry another coat or perhaps several more coats should be applied in the same way as the first. The more coats of varnish put on a floor, the more durable the finish. One gallon of floor varnish is enough for two coats on about 300 square feet of oak floor or about 200 square feet of pine.

WAXING

Waxing is considered by many the most attractive and practicable finish for hardwood floors. It preserves the natural color of the wood, brings out the beauty of the grain, and is easily revived and renewed. Given the proper care, waxed floors improve with age, even under hard usage. In some of the European palaces, for instance, floors that have been polished for centuries with nothing but wax are still bright and beautiful in color though now worn thin by use. The chief objections to waxed floors are the amount of labor required to polish them and the fact that water turns the finish white. These water spots, however, may be quickly removed by rubbing on a little wax with a woolen cloth or a weighted brush.

Wax of various kinds dissolved in turpentine is the basis of all floor waxes. Beeswax, carnauba, ceresin, or paraffin, or a combination of these may be used, and gasoline, ammonia, or some other volatile solvent is often used in addition to the turpentine.

Wax may be applied to a floor that has been stained, painted, or varnished, or directly on the bare wood. Hardwood floors are generally paste filled and in many cases surfaced with shellac varnish before being waxed. The paste fills up the pores, and the shellac varnish makes a hard foundation for the wax and prevents grease from penetrating and staining the wood. A waxed floor will be less slippery, however, if the shellac is omitted or if only a very thin coat is applied and well sandpapered.

Success in waxing floors lies in applying the wax in thin coats and rubbing it a great deal. One pound will coat about 250 square feet of floor. After the preliminary coats of filler or varnish are thoroughly dry, the wax should be rubbed on with a woolen cloth, a piece of old carpet, or a brush, and allowed to harden overnight. The next morning the floor should be polished lengthwise of the grain with a weighted brush or a heavy block wrapped in woolen cloth, burlap, or old carpet. Then one or perhaps two more coats of wax should be applied and rubbed down in the same way as the first.

OILING

Oiling is a rather common and economical way of finishing kitchen, pantry, bathroom, and porch floors and is by many considered more satisfactory for pine floors than varnishing. Oil is easy to apply, gives a finish that is durable and not slippery, and penetrates the pores of the wood so that it is proof against grease and water spots. Oiled floors, however, darken with use and in time become dingy because dust clings to them and unites with the oil on the surface.

Boiled linseed oil is the kind most commonly used and may be applied clear, either hot or cold, or combined with turpentine, which makes it penetrate the wood better and leave a thinner film on the surface. A mixture of equal parts of oil and turpentine is recommended for pine floors.

If desired, a floor may be stained before it is oiled, but in any case it should be clean, dry, and free from dust when the oil is applied. The oil should be brushed on lengthwise of the grain of the wood, rubbed in with a soft oily cloth, and any excess wiped off with a dry cloth. After the oil has dried for a few hours, the floor may be polished with a weighted brush covered with a clean woolen cloth or piece of carpet. Most floors will absorb two coats of oil.

PAINTING

Paint is very commonly used on softwood floors, but is not a very durable finish, and worn places can seldom be satisfactorily patched.

Painted floors are, however, easy to clean, for the paint forms a coat impervious to water and grease, and they can be made to match or harmonize with woodwork or furnishings.

Paints, like varnishes, vary in durability according to the materials in them. Special floor paints of good quality are on the market, or they may be mixed at home. If only one or two floors are to be painted, one of the ready-mixed kinds will be found more economical and convenient, and one gallon will generally be enough for three coats on about 200 to 300 square feet of floor. White lead, zinc white, linseed oil, drier, and coloring matter are the chief ingredients in a good floor paint.

A kitchen floor should have three coats of paint, and the wood should be clean, dry, and free from dust before the paint is applied. According to the United States Bureau of Standards, the first coat should consist of white lead in linseed oil, with a little drier; the second coat, of equal parts of white lead and zinc white in oil, coloring matter as desired, and drier and turpentine to give a flat finish; and the third coat, of the same materials as the second, except that instead of turpentine good floor varnish should be added in the proportion of one to four pints to a gallon of paint. Each coat of paint should be thoroughly brushed into the wood, lengthwise of the grain, and allowed ample time to dry. If desired, a coating of equal parts turpentine and linseed oil may be rubbed on with a soft cloth after the last coat of paint has dried thoroughly, and the floor then polished with a woolen cloth. This gives a soft lustrous finish and makes the paint wear longer.

TYPES OF RUGS[1]

By ELSIE RICHARDSON

Carpets were originally made by hand, now the majority of them are woven on power looms. Brussels, Wilton, Velvet and Axminster are the principal kinds. There are also machine-made Oriental, ingrain, rag, fiber and grass carpets and rugs. All carpets and rugs are made of warp threads which are set lengthwise in the loom and woof threads set crosswise. All carpets and rugs are divided into the following classes:

Flat carpets and rugs.—May be used on either side, as rag, ingrain, fiber and grass.

Loop-pile carpets and rugs.—Have uncut pile as Body Brussels and Tapestry.

[1] From *Floor Coverings*. Home Economics Bull. 87. Iowa State College of Agriculture and Mechanic Arts, 1925.

Cut-pile carpets and rugs.—Are Wilton, Axminster and Velvet.

Brussels rugs.—Are made by looping yarn over a series of long wires; when weaving is completed the wires are withdrawn, leaving loops in the yarn.

The quality of Brussels rugs may be judged by the number of loops to a square inch, the kind of backing and whether the surface thread shows on the backing. For each loop or tuft on the surface, there are four strands of yarn buried in the body. This gives the Body Brussels its name. They are all worsted and dyed in the yarn. The loops are not as high as the pile of a Wilton. Body Brussels is the best of this type and is very serviceable.

Tapestry is an imitation of the Brussels, made according to the same principle. It is a loop faced fabric, with a wool surface. The design is printed on the threads before weaving. The yarn is all used up on the surface and none is carried to the back. Because the design is printed on the thread, it is not so clearly outlined on the finished rug.

Wilton rugs are woven in the same way as the Brussels, except when the wires are withdrawn, a sharp knife on the end cuts each loop. This leaves a straight, long, upstanding pile. A real Wilton rug is dyed in the yarn, and a greater amount of pure, worsted yarn is used in it than in any other rug. Colors in the surface yarns are carried to the back as in the Brussels. The wearing qualities of the Wilton are excellent.

Axminster rugs are of the cut-pile type. The yarn is dyed and the surface is of wool. They are woven somewhat on the same principle as the Wilton, but the method adapts itself to a greater variety in color and design. They are not so heavy and not so closely woven, which makes them less expensive. The Axminster is a very serviceable and economical type of rug. Although the wearing qualities are not so good as in the Wilton or Brussels, it is exceedingly good for the price.

Velvet rugs also have cut-pile and resemble the Wilton. They are made exactly on the same principle as the Tapestry, except that the loops are cut. It has wool only on the surface and the design is printed in the thread before weaving. Velvet corresponds to Tapestry, as Wilton does to Brussels in the process of making as well as wearing qualities.

Oriental rugs are hand woven by people of the Eastern Countries. They are dyed in the yarn with vegetable dyes. The designs are all symbolical. The value depends upon age, quality of material and richness of color and design. The real Orientals are exquisite and wear wonderfully well. They are extremely expensive and out of reach of the moderate income. There are many machine-made or American Orientals on the market at the

present time that are very fine imitations of the real Oriental. Most of them are Wiltons with Oriental designs.

Fiber and grass rugs have been very popular for porches and are sometimes used for other rooms in the house. These rugs usually have a cotton warp and a filling of wool fiber, flax, grass or twisted paper. Dyes are not very lasting in these rugs, but they may be freshened by brushing on new dye.

In comparison to the price of these rugs, they are fairly durable and good in design and color.

Linoleum is the most commonly used covering for kitchen, pantry and bathroom floors, and is used to some extent in the other rooms in the house. Linoleum may be the neutral background for other furnishings, or it may be the decorative element in the room. It must be chosen according to the same principles in design as other floor coverings.

Linoleum is made of linseed oil and ground cork. It is mixed to a plastic mass and applied to a burlap backing. There are three standard types of linoleum, plain, printed and inlaid.

The color of plain linoleum is put into the mixture before it is applied to the backing. Only one color is used. In this case, color extends to the backing and is good as long as the linoleum lasts. Plain colors show soil very easily. Plain linoleums are protected if they are kept waxed.

Printed linoleum is simply plain linoleum with a design stamped on the surface. The design will wear off. Varnish is a great protection to this type of linoleum.

Inlaid linoleum is the type in which the patterns are made separately and pressed into the backing. The colors are always good. To distinguish between an inlaid and printed linoleum, examine the cut edge. If the color extends to the backing in all designs, it is inlaid. To protect inlaid linoleum, it should be waxed.

TYPES OF LINOLEUM AND CORK COMPOSITION FLOOR COVERINGS[1]

By C. STANLEY TAYLOR
President of Taylor, Rogers & Bliss, Inc.

Resilient flooring materials are the outgrowth of a definite need for a suitable and economical floor over wood, concrete and other hard floor surfaces, and for a material which can be easily applied as a replacement

[1] From "Linoleum and Cork Composition Flooring Materials," *Architectural Forum*, October, 1928.

floor over old floors of any type. Cork composition products and rubber are the principal flooring materials having resiliency as a dominant characteristic. They have been evolved through many years of development and improvement, and have to-day reached a state of perfection and quality which places them very definitely in the class of quality materials having distinctive characteristics not present in similar combinations in any other type of floor surfacing material.

We are concerned in this discussion primarily with cork and cork composition floorings, which are known in the trade under the general titles of linoleum, linoleum tile, natural cork tile, and cork carpet. The evolution of cork composition flooring materials from the status of a floor cover to that of a finished flooring material has been slow, and architects have only recently awakened to the intrinsic values which such materials possess as contrasted with their use primarily as substitutes or replacement coverings. It must be acknowledged to-day that these products have earned for themselves a definite, permanent place in the building field, and that they offer to architects, builders and owners new opportunities for creating special effects in color, pattern and texture and for introducing other values of comfort, quietness, sanitation and maintenance that particularly adapt them to solving many modern flooring problems.

Types of cork flooring products.—The various types of resilient flooring materials, of which cork in some form is the principal component, each possess special characteristics which make it important to differentiate one from the other, both in this discussion and in the use and specification of such materials. The prevalent use of trade names to distinguish the various types of products is somewhat confusing and we must go back of the distinguishing and commonly employed trade names and classify the products in another manner. There are three major classes of cork flooring products: (1) Cork composition floorings, broadly termed linoleums and linoleum tiles; (2) natural cork tiles; (3) cork carpets. Their characteristics deserve consideration.

Natural cork flooring products.—Cork tiles are composed of particles of cork, such as the thin shavings of cork which are largely produced as a byproduct in the manufacture of cork bottle stoppers. These particles are compressed under heat in such a manner that the natural gums of the cork are liquefied and form the only binder required to produce a firm, rigid, and homogeneous product. The better grades of natural cork tile contain nothing but pure cork without any of the harder bits of cork bark or other foreign ingredients. The tile forms come in various sizes, usually in square

or rectangular shapes, and in thicknesses ranging from approximately $\frac{1}{4}$-inch to $\frac{1}{2}$-inch.

Natural cork tiles take their color from the cork itself and from the baking process which is essential to their manufacture. They are thus available only in natural cork browns of various shades, ranging from light to dark, according to the amount of heat applied. The extreme hydraulic pressure usually employed in the manufacture of cork flooring produces a material which is quite resistent to wear and abrasion, and which is at the same time highly resilient, quiet and pleasant to walk upon.

Cork composition flooring, linoleum.—In this type of flooring ground cork is a principal ingredient. The cork is pulverized almost to the fineness of flour and is mixed with oxidized linseed oil and various gums, fillers and pigments. The mixture is compressed under huge heated calender rolls onto a burlap backing employed as a measure of reinforcement on the underside. A process of curing the cork composition aids in producing a firm, homogeneous material of considerable resiliency which will not buckle or crack and which is practically free from odor. Cork composition floorings are available in many forms and in a number of distinct types. The sheet forms may be classified as Battleship Linoleum, Jaspe, Inlaid Linoleum, Embossed Linoleum and Marbleized Linoleum.

Battleship Linoleum is a high quality, plain color cork composition flooring in sheet form, which earned its name from its original use as a decking material over the steel decks of warships. It is available in various thicknesses from slightly less than $\frac{1}{8}$-inch to a full $\frac{1}{4}$-inch.

Jaspe Linoleum is distinguished by its striated pattern in two tones of a single color, giving a variegated effect and a characteristic appearance of graining. It is otherwise similar to Battleship Linoleum in its composition, and is usually available in three weights. Small insets of contrasting color are frequently used in Jaspe Linoleum with interesting effects.

Inlaid Linoleums have various patterns in which each individual color runs through to the burlap back. In surface appearance these linoleums often resemble a floor laid with individual tiles, but possess the advantage of lower initial cost and considerably lower laying cost because of its sheet form. This type of linoleum is available in many combinations of colors and in a wide variety of patterns, some of the small tile forms resembling mosaic tiles, and some patterns resembling quarried tiles or blocks of cut stone or slate, as well as other designs.

Embossed Linoleums are usually inlaid linoleums in which an apparent joint is introduced between the tile units of the pattern, and this joint is

compressed below the surface of the sheet to give the appearance of a masonry joint in a hard tile floor. The tiles themselves may also be embossed for decorative effects.

Marbleized Linoleums are classified separately because of their special appearance. Ingenious processes of manufacture result in producing a variegated color effect which resembles with remarkable fidelity the color and appearance of fine marbles, there apparently being no limitation to the manufacturing process in the reproduction of all types of colored marbles. Marbleized Linoleums may be in either full sheet forms, in which the marbleizing effect is carried out over the entire sheet, or of the inlaid type, having the appearance of blocks of marble laid in pattern.

The tile forms, which are sold under various distinguishing trade names, are essentially the same as the sheet forms in composition but are usually available only in plain colors or in marbleized effects. There are in addition a number of newer types constantly being developed which produce various special flooring effects, including a reproduction of wood plank floor, accomplished by using the Jaspe Linoleum with inset joint strips, pegs and butterfly wedges of darker color. The tile forms are in plain colors and in marbleized effects. Some manufacturers are producing an embossed tile for special uses which have the appearance of decorative faïence tiles and which are employed to introduce variety and interest in the pattern of a floor. The architect has at his disposal, in these materials, floorings to harmonize with any designs.

Cork carpet.—Though frequently classified with linoleum, cork carpet differs somewhat from both cork tiles and linoleums. It is composed of granulated cork using a different proportion of cork and linseed oil from that usually employed in Battleship Linoleum. It is compressed under heat. As the name implies, it is manufactured in sheet forms. It comes in several solid colors, and in thicknesses of approximately .22-inch (polished) and .26-inch (unpolished). Cork carpet has not the density nor therefore the resistance to wear of the several types of cork composition flooring material, but its great resiliency and relatively low cost give it a very definite utility for solving certain flooring problems.

These classifications cover the principal standard types of cork composition flooring, but it should be noted that each individual manufacturer is constantly developing new combinations and new patterns which have their special uses from both the decorative and service point of view. The essential features here noted, however, may be applied to the newer forms, and hence an extended discussion of them is not necessary before we proceed to the next consideration.

An important new development in the manufacture of linoleum and cork composition flooring materials is the utilization of pyroxylin or nitrocellulose lacquers to produce a surface wholly impervious to moisture, dirt and to the staining effects of many common materials such as ink, foods, greases, and mild acids . . . . The lacquer finish is not merely a surface painting in the ordinary sense, for the leading manufacturers, while retaining in secrecy the exact nature of the process employed, claim and demonstrate that there is a certain amount of penetration of the lacquer into the upper strata of the material, although no manufacturers claim complete penetration. The lacquer functions to close the minute pores in linoleums and other cork composition flooring products so that ordinary dirt and dust will not be ground into the surface, vastly simplifying the cleaning and maintenance operations. The nature of the lacquer employed is such that most common substances which will normally stain wood, marble, concrete and other types of flooring will not penetrate into the cork compound, and a spot can be readily wiped off from the surface without leaving any stain or mark. To a large extent the lacquer treatment eliminates or minimizes the need for waxing linoleum floors for their maintenance and preservation, although wax may be applied as usual if desired. Undoubtedly this new development marks a real advance in improving the life and utility of cork composition flooring materials, giving added qualities of sanitation, low maintenance cost, improved appearance and probably greater durability.

SUMMARY

Paints, tints, wallpaper, commercial fabrics, and wood paneling are commonly used for wall finishes and coverings. Plaster is finished both with rough and smooth finishes. Rough finish should be suitably used with consideration for the style of architecture, size of rooms, and type and style of furniture. Artistic results are obtained by paneling smooth plaster walls with wood or plaster molding. Picture molding frequently is used. Plaster walls also are commonly painted both with flat paints and with calcimine. Wash paints are most suitable for kitchens and bathrooms. Good effects may be produced by the use of plastic paints if properly applied. These may be used on any materials that may be successfully painted with ordinary paint.

Wallpaper long has been known as a desirable wall covering. New wash wall coverings are on the market that are most satisfactory. Antiqued paper and waterproof papers are also in use.

Wood paneling which was formerly too expensive for the family with a small income now may be obtained at reasonable cost.

For South rooms which are light and sunny, cool colors, medium in value, may be used to soften light. North rooms with less light need light, warm colors. In small rooms which are comfortably lighted, colors light in value will accentuate the size. Furniture may be emphasized by the use of a wall color grayed in intensity, and light of value.

The kind of finish selected for new wood floors depends upon the wood and the preference of the individual. Durability, ease in cleaning, and economy in replacing are considerations which should be observed. The most common finishes are stain, oil, paint, varnish, shellac, and wax or a combination of two or more of these materials.

Brussels, Wilton, Velvet, and Axminster rugs are commonly used. Tapestry is an imitation of Brussels and similarly made. In addition to these floor coverings there are Oriental rugs, Chinese rugs, fiber and grass rugs, and linoleums.

Resilient flooring materials are the outgrowth of a definite need. Cork, composition products, and rubber are the principal materials having resilience as a dominant characteristic. The three classes of cork-flooring products are: (1) Linoleum and linoleum tiles, (2) natural cork tiles, (3) cork carpets. The new lacquer treatment of linoleums provides a surface which is not easily stained and also adds qualities of sanitation, low maintenance cost, and durability.

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CHAPTER XII

ESSENTIALS IN HOME FURNISHING

FURNITURE AND ARCHITECTURE[1]

By R. W. SEXTON

In an age of standardization we have not yet standardized good taste. We are all still free to exercise our own opinions as to what is good and what is bad in art. While harmony is the basis of design, what one may consider harmonious another may deem devoid of all harmony. It is in our interpretation, then, of the principle embodied in the word that our standards of good taste are grounded. Harmony in a composition might be described as that quality which tends to retain unity between the various elements. The success of a musical composition is dependent upon the laws of harmony; a composition painted by an artist on a canvas must be harmonious in design and color to warrant approval; and in the design of a completely furnished room or interior one must immediately sense a harmonious relation between the various furnishings and the details of the architectural scheme in order to truthfully say that the room is well designed.

While I have in the preceding paragraph paralleled the design of a completely furnished room with the composition of a musical score and that of a painted canvas, there is a vital difference which should not be overlooked. A musical composition and a painted picture are each the work of one person, while in the design of a room one artist—the architect—starts the composition, and another—the decorator—finishes it. This unusual procedure frequently tends to disrupt harmony. To apply the same procedure to the development of a musical score or to the completion of a painted picture would undoubtedly result in a dismal failure. In order to be successful as a team, one might say, the architect and decorator must not only collaborate, but must actually have similar ideals. They must not only appreciate the value of harmony between the various elements that go to make up the finished room, but they must have similar ideas as to the real meaning of the word "harmony."

We are just emerging, fortunately, from an era which might be de-

[1] Adapted from "Furniture and Architecture," *Good Furniture and Decoration*, September, 1929. Reprinted through the courtesy of *Good Furniture and Decoration Magazine.*

scribed as "The Revival of the Periods," during which time we showed no evidence of possessing any originality or creative ability whatever. We "originated" period designs, "adapted" period ideas, and "reproduced" period details until the entire country was astonished and ashamed to find that during this era, while we had been copying designs originated in some European country five and six and seven centuries ago, these same European countries had been seriously and successfully developing an art which would express their modern character and reflect their modern tendencies.

During the "Revival" epoch in this country, however, we learned a lesson. It was easy to practice harmony under conditions that then prevailed. A Louis XVI room needed Louis XVI furniture. It was as easy for the decorator to design or select Louis XVI chairs as it was for the architect to panel the walls in true Louis XVI character. The client or owner in those days gave to his architect and decorator an order to execute that called for little if any ability. What a difference today! An architect designs a room to reflect modern impulses, to satisfy modern desires, and to express modern tendencies. . . . .

Let us consider how the decorator may attain harmony between the design of the furniture and the architectural treatment of the interior, for unquestionably the furniture is the feature of the decorative scheme. Design, as used in this particular case, means much more than composition. An artist designs his composition and then paints it on canvas. His design is merely a picture. The architect and the furniture designer, however, find that design has a much larger meaning than that. To them, design means, first, materials. The physical properties which a material possesses very largely influence design in both architectural and decorative spheres. Materials have pattern, color and texture, too. Then, design means giving a form to these materials. The architect and furniture designer compose their designs in two dimensions, as does the painter, but they must create a design that can take shape in certain materials in three dimensions, so that the finished object will satisfactorily serve a definite purpose.

Very often harmony between a piece of furniture and the architectural treatment of a room is obtained by employing similar materials in both schemes. Thus there is effected in the design a certain relationship which is not limited to the natural pattern of the material and its color, for certain materials stipulate a certain type or style of craftsmanship. Let me illustrate my point. The coarse, open grain of oak, for example, is particularly adaptable to crude and rugged details. Thus in a room in which the

ceiling is beamed with hand-hewn timbers of oak and the floor is laid of random-width oak planks, harmony is attained by introducing oak furniture of a similar style of craftsmanship. Another illustration might be that of a room in which the walls were designed of mahogany with ornamental motifs occasionally carved in the wood. The detail of the ornament carved in mahogany would be entirely different from ornament carved in oak, for example, due to the fine and close grain of mahogany. Thus, to effect the proper relationship between the architectural treatment and the furniture, it would be necessary to use for the furniture some wood which also was characterized by a close and fine grain in order that a similarity of craftsmanship might prevail.

Often an attempt is made at harmony by introducing in the wall decoration, by means of applied plaster or painted ornament, some detail which is featured in the upholstery fabric used to cover the chairs, for example. This may tend to make the finished scheme more unified, but this alone will not create a harmony which is satisfying. The tendency toward a greater expression of originality and creative ability (which we absurdly refer to as "the modern movement") makes the attaining of harmony between architecture and furniture more difficult. Modern design involves the interpretation of modern impulses. The architect and decorator may have entirely different ideas as to what modern impulses should be expressed and what should not. It is up to the decorator to attune himself to the architect's ideas, however, if he would attain success. The architect designs the house; he decorates the interior, to a very great extent, when he designs the woodwork, the mantel, the floor and the ceiling, although his ideas on the placing of the furniture, as well as its design, are seldom sought. And he has his own ideas, too. He could not design a room successfully if he did not visualize it completely decorated and furnished to the very last detail.

PRINCIPLES OF GOOD FURNITURE MAKING[1]

By RALPH C. ERSKINE

The ability to recognize good furniture comes from an understanding of the elements and principles which are at the bottom of good furniture making. . . . .

While we still adhere to the best traditions of cabinetmaking, both in design and manufacture, our modern ingenuity has developed some

[1] Adapted from "How To Recognize Good Furniture," *American Home*, March, 1930.

methods which take their place beside the time-honored ones. These include new mechanical processes by which pieces of furniture, while retaining all the grace of the old designs, are often constructed by methods which make them more enduring and more adapted to our climate than many of the old examples. Quantity production now makes it possible for everyone to have good furniture, beautifully made, which, in the early days of America, could have been found only in the mansions of the very wealthy. These methods include the modern use of veneers, of plywood, of inlay, and of enduring finishes.

In buying furniture nowadays values are determined by two things: Utility and style or design. Utility means strength, comfort, capacity. Style and design mean proportion, form, correctness of traditional details of ornament in a given period, and all those elements which go to make up its value in the eyes of a cultivated community. . . . .

In knowing good furniture it is the little things that we have to look for as the essential points of larger import. There are fundamental principles of construction and finish that make all the difference between good and bad furniture. Good construction may be studied without regard to period, and its simplest details make a fascinating study for the householder, for they include the curing of wood, the ingenious use of plywoods, the knowledge of veneers, of built-up stock, of joinery, and the proper use of all these elements. Let us take up some of these in detail.

Plywood.—There is a method of making such parts of furniture as table tops, the backs of bureaus, and bottoms of drawers that will prevent warping and cracking. This is the process of gluing together thin sheets of wood, layer upon layer, and the method is called "lamination." The gluing is done under tremendous pressure, and the grain of the interior layers is made to run across the grain of the top and bottom layers so that there can be absolutely no swelling or shrinking in any direction. If there are three layers, or laminations, it is called "three-ply"; if five, "five-ply." Good glue, properly prepared, is a marvelous substance. If two pieces of wood, fully dried, are planed so perfectly on their edges that you cannot see the light shining through between them when they are held together, you can apply the thinnest film of glue, rub them together when hot, set them in clamps to dry, and you cannot break them apart on the glued joint. The wood will tear before the glue will give. On exposed tops and on doors there should be always a thin frame of solid wood around the edges to conceal the laminations. For instance, in making a Sheraton side-

board with curved front and doors, it is much better to have these doors built up than to saw out solid wood on a curve, especially when the wood is to be finished with a highly figured veneer.

Points where you should look for laminated or plywood construction are tops, ends, and backs of bureaus, backs of mirrors, paneled ends of bureaus, paneled doors, and drawer bottoms. The makers of cheap furniture have been substituting paper or wallboard backs for bureaus and mirrors. It is well, therefore, to turn a bureau around and look at the back before you buy it. Also, see if it has a dust board between the drawers, as a good bureau or chest of drawers should have. These are thin, horizontal partitions which keep dust from working down back of the drawers, and make it impossible to see into a lower drawer by pulling out the one above it. Thus, one drawer may be locked safely without regard to the other.

Curing the woods.—The furniture that you put into your house should be made by firms adequately equipped with the proper scientific apparatus for curing the woods. A poorly cured piece of wood will shrink or swell, causing damage that cannot be repaired easily. For furniture, wood must have stood "on the sticks" in the open air in piles, from two to five years. This is very important. After this, it can be put through the kilns. Briefly, the process of curing is to put wood into kilns where warm, live steam can be turned in until all the lumber is brought to the same state of dampness. Then the temperature is increased gradually and the amount of dampness reduced, until each board is uniformly dry through and through. Dry heat applied suddenly would make a hard case around the surface, imprisoning the moisture that would later dry out causing the wood to crack and warp.

Much as we like the idea of furniture built to our special order in some little cabinet shop, we owe it to ourselves to find out what facilities the maker has for obtaining properly cured woods. An unfinished board will reabsorb at least 12 per cent of moisture simply in transportation or when lying around in unheated places.

Veneers.—There is an inherited prejudice against the word "veneer." To many people it means superficial show and this impression probably dates from the time when an atrocious false Colonial type of furniture was produced, where heavy scrolls and brackets were made of soft wood and overlaid on all the surfaces with thin veneers of crotch mahogany. Veneers have their proper uses and the great cabinetmakers of the past employed them on their finest pieces to get beauty of grain in appropriate

places. It is only the abuse of veneers that has brought them into disrepute.

It is a very costly and laborious process to apply veneer properly, but it would be practically impossible to obtain the beautiful effects of ferns, waves, and scrolls by any other method. The wood from which they are cut comes where the great roots join together, and solid boards cut from these places would crack and check to such a degree that they could not be used.

The most usual forms of veneer found in high-grade cabinetmaking are crotch mahogany, cut from the crotch of the tree; figured walnut, taken from the heart of walnut stumps; and burled walnut, elm, and oak, cut from burls or gnarled growths caused by the stings of insects in the young tree. Some of these burls grow to tremendous proportions, and I have seen whole groves in the mountains of North Carolina where almost every tree was afflicted with these gnarled and fantastic protuberances, so deformed and yet so valuable to the veneer sawyer.

One of the wrong ways to use veneer was mentioned above, that is, on exposed surfaces where it is liable to be knocked off in the ordinary wear and tear of use. Many people have purchased old pieces of furniture of the style that is distinguished by heavy bracket scrolls, thinking they are valuable simply because they are old and made of mahogany, and have been greatly disappointed when the veneer cracked and came off in large pieces. Good design and workmanship—not age nor sentiment—are the most important features of a piece of furniture.

The proper use of veneer in good furniture building is for the beautifying of drawer fronts, the inner spaces of panels, all inlaid surfaces that are not unduly exposed, and outside edges which have some projecting members of solid wood. For instance, in some fine old models there is a raised bead around each drawer. This is a thin strip with rounded edges that is set into the drawer front like a frame around a picture. It projects slightly beyond the surface of the drawer front and thus offers protection to the figured wood which has been applied for its beauty. When you see an old piece that has beautiful wood in the drawer fronts with these projecting beads around each panel, ten to one it is a good piece in other respects. These details in construction are sure signs of integrity in workmanship, and it is not likely that a maker who executes them carefully would be ignorant of the other elements of good design and good construction.

Joinery.—One of the most important points in the construction of good furniture is the way the different joints are made, as careful workmanship

here is absolutely essential if the piece is to last and give good service. An explanation of the details of some of these joints may be helpful. One of the best known joints is the "mortise and tenon," which is a type that was universal in all old furniture. When the end of a board is fastened into the side of another, as in a door frame, a tenon, like a tongue, is cut on one end of the board and fitted into a mortise or rectangular hole that is cut out of the side of the other board. The tenon should fit like a glove into the mortise before it is glued. Often in old pieces a peg was put through from the outside with the end left showing. This is called a "pegged joint" and is regarded as a mark of quaintness and handwork. Pegging of joints is appropriate in pieces of oak, maple, pine, and early walnut dating up to 1740 in design, but is rarely found in mahogany pieces except in very fine chairs where the seat rails join the back posts.

A dowel joint was invented to take the place of a mortise and tenon. Instead of the rectangular tenon on the end of a board, the end is sawed off straight, and a little "pin," or round stick, is put in to join both pieces together. When done in upholstered chair-frames this practice is correct, but dowel construction as commonly practiced in desks, bureaus, and even tables and chairs, is the cheapest known method of joining, and is bad more often than good.

A dovetail joint is used in fastening a drawer side to a drawer front. Pull out a drawer and you will notice a series of little key-shaped notches down the corners. There is no adequate substitute for this joint. It is exactly what its name implies, a projection cut in the shape of a dove's tail, and, like the keystone in an arch, has tremendous strength when fitted into the notch cut to receive it.

In hand-dovetailed drawers, long and short dovetails alternate, and all old pieces have this method of construction. Many old chests were made with dovetail joints at all four corners, and sometimes the ends of an old bureau were dovetailed to the top. If this construction is found on a piece made by a modern maker you may be sure he has a fine appreciation of the highest qualities of workmanship. A machine-made dovetail joint is practically as durable as the handmade joint. It is used on the finest modern furniture, and is, therefore, not a guide to quality of workmanship, but is an infallible guide to the age of a piece as no antique example has machine-made dovetails.

Flush construction is an excellent indication of quality of workmanship. Any chair, table, or cabinet that possesses it shows that the maker has taken extra care and spent additional money for the sake of good

tradition in design. Flush construction means keeping the outside faces of two pieces of wood that join each other flush or smooth to the touch.

In upholstered furniture, correct tying of the springs is another important thing to be considered. In the best upholstered furniture springs are tied by hand eight or ten times, and this work is an art in itself.

[NOTE.—*Simplified Practice:* The purpose of simplified practice is to eliminate waste, and the coöperation of the Division of Simplified Practice of the U.S. Department of Commerce with manufacturers, distributors, and users has reduced the variety of sizes, dimensions, patterns, and models of many materials and articles. The varieties of beds, springs, and mattresses have been reduced from 78 to 4, bed blankets from 78 to 12, sterling-silver flatware from 190 to 61. Other recommendations by the Division may follow later.]

ADVANTAGES AND DISADVANTAGES OF BOTH VENEER AND SOLID FURNITURE CONSTRUCTION[1]

The advantages of veneered construction as compared with solid construction may be summed up as follows:

1. A ply-wood panel is stronger, in some respects, than a single board of the same thickness.

2. The cores of veneered panels may be made of softer, lighter, and cheaper lumber than can be used for solid construction.

3. Highly figured woods, some of which it would be impractical to use in thick sizes because of their cross grain and resulting irregular shrinkage, can be used for face veneers. This method has the additional advantages of reducing the expense of the use of highly figured woods and of making the supply go farther.

4. Because of the thinness of the finer face veneers, several pieces, cut consecutively, look practically alike and can be matched to produce symmetrical figures impossible to attain in solid construction.

5. Under ordinary methods of construction, for reasons already explained, veneered panels are less likely to shrink, check or warp excessively than solid pieces.

6. Curved and irregular surfaces can easily be produced by gluing veneer together in shaped forms which would be difficult if not impossible to produce from solid lumber.

The following are the principal advantages of solid construction:

1. The owner has the satisfaction of knowing that the furniture he

[1] Adapted from *The Identification of Furniture Woods* (out of print). U.S. Department of Agriculture Misc. Circ. 66 (1926).

possesses is constructed throughout of the kind of wood represented at the surface.

2. The wood can be carved, which is not practicable in veneered construction unless special provision is made for it.

3. In case the surface chips off, the same kind of wood is exposed.

4. The surfaces can be heavily sandpapered or even planed off and refinished—operations which, as a rule, are not practicable with veneered construction.

5. The surface layers can not loosen and peel off, as may occur in veneered panels when they are not properly constructed or are allowed to become wet for any length of time (unless a water-resistant glue is used); although prolonged dampness may likewise have deleterious effects on the glue which is used in the joints of solid furniture.

IMPORTANT CONSIDERATIONS IN FURNITURE SELECTION AND ARRANGEMENT[1]

By ELSIE RICHARDSON

Always consider the spaces in rooms before furniture is selected or you may awaken to the fact that the beautiful things selected do not fit in.

After the necessary articles have been chosen, the big thing is to get them together so that they serve the purpose best and appear attractive. Usefulness is evident and tangible, but beauty is more vague and left to the tastes of those responsible. Certain elements of beauty must be considered.

Unity is that quality which draws the room together as a whole. There must be one important element throughout, with other elements subordinated to it. This dominant element in line may be the graceful curve which can be repeated in furniture and hangings or the straight line designating strength and formality.

A dominant color in the scheme of decoration is necessary to give the desired substantial background. Other colors are keyed to this one. If the background is a value of neutral tan the écrus, golds and tans key in better than does a silver or gray. The room as a whole should have a dominant element or center of interest, as a fireplace and mantel or an arrangement which features an attractive and useful group of windows. In carrying out a dominant element, do not overuse it. It must be just strong enough to tie all parts of the room together, giving that feeling of

[1] Adapted from *Furnishing the Home*. Home Economics Bull. 42. Iowa State College, 1928.

oneness. The element, unity, spells restfulness but beware that it does not change its name to monotony. The room in values of brown is a very dull, drab and depressing place unless it is relieved with bits of cheery contrasting colors, such as orange or blue-green.

Variety is the element of contrast. It breaks monotony and adds interest. Contrast stimulates through opposition, consequently it must be used very sparingly to prevent confusion.

The graceful curved line is given more character by the use of an occasional straight line. Dark tones are given more charm when opposed by bits of lighter tone. Subdued colors are given snap by a splash of bright color. It takes variety in unity to produce beauty.

Proportions.—To make a room seem to grow together just as if every piece belonged there, good proportions must be emphasized. The apparent proportions of a room may be improved. Low ceilings give the feeling of restfulness, while high ceilings tend toward formality and stiffness. Features which decrease apparent height of ceiling:

1. Ceiling not extremely light.
2. Direct lighting system.
3. Horizontal lines in furniture.
4. Straight line molding in wall decorations.
5. Floor emphasized by use of large rug of heavy texture, rich color and design.

Features which increase apparent height of ceiling:

1. Ceiling very light.
2. Central lights to call attention to ceiling.
3. Vertical lines in furniture and window decorations.
4. No moldings in wall decorations.
5. Rug, small, plain and inconspicuous.

Features which decrease apparent size of room:

1. Dark colors.
2. Warm colors. Colors with red or yellow predominating.
3. Design in rugs, walls, upholstery or draperies.
4. Strong contrasts in color, line and design.
5. Heavy massive furniture.
6. Many decorations.

Features which increase apparent size of room:

1. Light colors.
2. Cool colors. Colors with blue or gray predominating.
3. Plainness instead of design.
4. Unity in color, line and design.
5. Light-weight furniture in graceful lines.
6. Few decorations as possible.

Balance is that element which holds the entire room in a state of equilibrium. Such features as color, form, texture and contrast have their influence in the problem of balance. The warmer and purer a color is, the more decorative weight it holds. A striking contrast will call attention and lend much weight. Coarse, rough texture adds more weight than a smooth fine surface. Heavy carved furniture seems heavier than light furniture with graceful curves.

FIG. 54.—Simplicity is desirable in the small, inexpensive living room. The rough-plaster walls and the beam ceiling make ornamentation unnecessary. (Santa Barbara State Teacher's College practice-house living room.)

Bi-symmetrical balance divides the space in the middle and decorates exactly the same on the two sides. This is merely a mechanical process. It gives the effect of formality. A whole room could not be decorated in that way or it would become very stiff and uninviting. With the greater part of the room in rather informal lines, the bi-symmetrical wall groupings are very effective. The mantel is very charming with a picture or tapestry above, a low bowl in the center and candlesticks at the ends. A console table beneath a picture or mirror is held in position by the use of the candlesticks on the ends, and perhaps a piece of pottery in

the center. A buffet makes a very attractive formal spot with a bowl of flowers in the center and candles at the sides.

Grouping of uneven numbers are more artistic than those of even numbers.

Occult or informal balance is not a mere mechanical process. It is tying down one side against another by the use of articles not identical. In this case balance is not so evident, yet it exists in an easy, natural sort of way. Consideration of the decorative weight of furnishings is very essential in occult balance. If a group is heavy and seems to overbalance when against the wall, it may be placed nearer the center of the room, thereby decreasing the apparent weight.

A fireplace with a davenport, small end table and lamp on one side may be balanced by a table, chair and lamp on the other side. Balance from one end of the room to the other is secured by the placing of separate groups of furniture. Do not sacrifice the use of a chair or table to secure balance. Arrange in useful groups, or the stiff, lonesome atmosphere will creep in. Occult balance will be observed in the living room group.

Color is undoubtedly one of the most expressive elements in decoration.

A home without color seems to represent a colorless personality, while a home with too much color becomes gaudy and speaks of poor taste. The more highly the tastes are cultivated the less contrast in color and decorations is necessary to satisfy.

The background of the room should follow the general scheme found in nature—the floor the darkest area, walls second, and the ceiling the lightest portion. In general, the background should be kept in quiet, neutral tones. If the background is "noisy" in itself it is impossible to place decorations against it so that they appear to the best advantage.

Intense colors must be used only in small proportions to add life, interest and character to a room.

Contrasting color harmony is much more difficult to use than harmony of likeness, but is very effective. A room where a great deal of blue is used may look very solemn, dignified and cold unless it is cheered by some splashes of warm contrasting color. Orange will add the snap that is lacking. It may be supplied by a bowl of flowers, lampshades or pieces of pottery. As soon as the use of contrasting color is overdone, it loses its charming effect. Contrast is less sharp and effect is better with three harmonizing colors, instead of two.

Colors with red or yellow predominating impart warmth and make the room appear smaller, while those with blue as the dominant element are

cool, solemn, dignified and give space. Light colors give more space than dark colors. It is well to consider the amount of sunlight and size of room when selecting a color scheme.

Persons should choose colors for their rooms and their homes to suit their own types. It is just as necessary that one should appear well in her home as a background, as to choose costumes that are of the appropriate colors. The house should be the frame and the family the picture of home life. The frame must always be kept subordinate to the picture and its colors chosen to enhance the beauty of the picture. The same is true of the home picture.

Design is very closely related to color. A room without design lacks individuality. In choosing design in rugs, cretonnes and tapestries avoid that which seems to have depth, or which is spotted. That type flies out to greet you when you enter the room. An indistinct all-over pattern closely related to its background is more dignified and restful.

Large, distinct and colorful designs take up space and should not be used in a small room. Wallpapers of plain or very indistinct patterns are best in all rooms because they are not tiresome, and make the ideal background.

A room lacks character with everything plain as well as with everything in design. It is essential to balance plainness and design. A little bit of design will balance a great deal of plainness. If a beautiful, designed rug is used on the floor, it should not be killed by the use of figured wall paper or figured over draperies, but they should be kept plain and subordinated to the rug. If the rug is plain, design may be introduced in the upholstery or draperies. If the wallpapers are figured, the window draperies should be kept plain. Pictures, tapestries and other decorations are not well used against figured walls.

Line.—After the determining principles have been studied, the actual placement of furniture is simple. In the first place, do not overcrowd. Eliminate all useless pieces. Line is the main feature to be considered.

In order to have a definite scheme of decoration, it is best to place the main pieces of furniture, as davenport, piano, large table and desk parallel with the walls, whether they are against the walls or not. Straight lines should be observed in the bedrooms in placement of bed, table and dressers.

The stiffness is broken by grouping furniture in the charming centers of interest and by placing minor objects, as chairs, small tables, etc., where they are really the most useful, regardless of line. An easy chair is scarcely ever placed at right angles with the walls and major pieces of

furniture. In fact, it looks more inviting, if it is a little off the straight line.

Rugs should be placed straight on floors. To place them obliquely is similar to hanging a picture that way. The idea that the home-like atmosphere is destroyed by the straight-line arrangement is wrong.

WINDOW TREATMENT

Glass curtains and draperies both are of importance in obtaining the desired results in interior decoration. By regulating light, framing a view, accentuating color, they will add to the beauty of the interior if carefully selected and properly designed. Also, since they represent an appreciable portion of the furnishing budget they should receive careful consideration both in selection of materials and in methods of hanging. Owing to the fact that an excellent publication, *Window Curtaining*,[1] prepared by the United States Bureau of Home Economics, is easily obtainable, the subject will not be discussed here. This bulletin contains valuable information on the selection of materials and directions for the making of glass curtains and side draperies, detailed directions for making curtains for the various rooms and for special types of windows. The list below taken from the above-mentioned bulletin is a few of the hundred or more glass curtain and drapery materials that are on the market:

FOR GLASS CURTAINS

Batiste	Marquisette	Pongee
Cheesecloth	Mull	Scrim
Dimity	Nets and laces	Swiss
Lawn	Organdie	Theatrical gauze
Madras	Pineapple cloth	Voile

FOR SIDE DRAPERIES AND DRAW CURTAINS

Armure	Damask	Prints
Brocade	Drapery denim	Rep
Burlap	Gingham	Satin
Casement cloth	Japanese crêpe	Showerproof fabrics (for bathroom and kitchen)
Challie	Madras	
Chintz	Mohair	Taffeta
Corduroy	Monk's cloth	Terry cloth
Cotton homespun	Osnaburg	Velour
Crash	Percale	Velvet
Cretonne	Poplin	Velveteen

[NOTE.—*Window shades:* In most parts of the house plain shades are preferable. There are many shade materials on the market including a number of new ones. Cambric shades, holland shades, plain and designed chintz, painted cloth treated with lin-

[1] Obtainable from the Government Printing Office, Washington, D.C.

seed oil, Austrian cloth (a crinkly fabric woven in slender stripes), book muslin (treated to render it translucent), and others are in common use. Waterproof shades are desirable for kitchen and bathroom.]

THE IMPORTANCE OF COLOR

Color is becoming more and more important in both house furnishing and equipment, and it is now daringly used in furniture, upholstery materials, draperies, bath and kitchen equipment, and even in small kitchen utensils. Even though more color is in use, the principles governing it remain the same. To use color effectively and artistically in interior decoration requires something more than merely becoming "color conscious." Although we do not know just to what extent colors please us or irritate us, we do know that certain combinations of color are annoying to some persons and other combinations are pleasing. It requires a knowledge of the use of color—its effect on the height and breadth of rooms, the effect light has on it, the effect of certain colors upon each other, color harmony and contrasting color harmony, and of many other uses to obtain successful results. Color theory will not be discussed in this chapter as there are many good books on the subject.

A few principles should be observed, however, if best results are obtained with color in furnishing a home. Colors differ according to their dimensions, that is, in warmth, in lightness, and in value. Exposure, area, and shapes and colors of objects in a room dictate uses. "The law of areas" is perhaps one of the most violated of color laws. According to this law, large areas should be restful with few or no contrasts while small amounts may show decided contrasts. In furnishing it is well to keep in mind that in all color combinations there should be a predominating color or principal color and that backgrounds should be kept subdued or dull in effect, particularly if the objects in the room are to stand out and to appear effective. The "keying of colors" also is important. This may be done by mixing them to introduce one color in common or by uniting them by means of a neutral color. There are a number of other ways also to key colors.

Some color combinations are pleasing and others are not. There are, however, certain harmonies that will produce pleasing effects under nearly all conditions. Whatever the combinations used there should be one color in common throughout. Color may also be used to change the effect of the size of rooms. Small interiors may be made to appear larger through the use of light colors. Before deciding upon the color of a room its size,

the amount of light, and its architectural treatment should be considered.[1]

A SUGGESTED LIST OF FURNISHINGS FOR THE SEVEN-ROOM HOUSE[2]

By MRS. CHARLES BRADLEY SANDERS

THE HALL

The first impression of a house and its occupants comes as one enters the front door into the hall. Thus, nowhere in the entire house is it more important to strike the right keynote in furnishings and decoration. If there is no closet in the hall for wraps and umbrellas, it will be necessary to have, in some obscure corner, a wooden strip painted the same color as the woodwork, in which are . . . . hooks, placed low enough so that the young members of the family can reach them.

A SUGGESTED LIST OF HALL FURNISHINGS[3]

Floor coverings.—Rugs, long runners, square or oblong, depending on the shape of the hall, of Wilton, Brussels, Axminster, wool braided, or any short-nap carpet, preferably in small design.

Linoleum in plain colors or large tile squares.

It is entirely a matter of choice as to whether stairs be carpeted or uncarpeted. Stair carpet should, if used, match hall rugs or carpet.

Table.—Small or medium size, in any of the hardwoods or painted softwoods, drop-leaf, square, oblong, or console shape.

Mirror.—Antique gilt, wood and gilt combined, plain wood, or in frame painted to match table.

Chairs.—One or two straight chairs, with or without rush, cane, or upholstered seats, in any of the hardwoods or dark-painted furniture.

Low-boy or table with drawers.—In any of the hardwoods or dark-painted furniture. For gloves, string, scissors, pencils, paper, etc.

Large chest.—In oak, walnut, mahogany, or painted or stained to match the woodwork, for overshoes, etc.

[1] For information on color see Goldstein, *Art in Every Day Life*, pp. 184–220; also Wright and McElroy, *House & Garden's Book of Color Schemes*.

[2] Adapted from *How To Furnish the Small Home*. Better Homes in America, 1929. The kitchen and kitchen equipment will be discussed in the following chapter.

[3] It should be understood that very few of the following pieces would be needed or could be accommodated in the hall of the small home.

Telephone-stand and small chair.—To correspond with other furniture if the telephone is in the hall.

Pictures.—Should be few, framed in antique gold or dark wood frames. Types: Samplers, engravings, etchings, or prints of interest to all.

Accessories.—Card-tray of wood, silver, or brass, and a stone or pottery vase for flowers or branches are all that will be needed.

A plain pottery or composition jar, harmonizing with walls and carpets, is appropriate for umbrellas.

THE LIVING ROOM

As the living room is the gathering place for family and friends, it may well be considered the most important room in the house. It should take its keynote for decoration from the hall. If there is a wide doorway connecting the living room with the hall, the color scheme should be the same. As the living room serves as library also, open bookshelves, painted the same as the woodwork, are essential if bookcases are not desired.

The first requisite of such a room is that it shall be restful. Avoid using rocking-chairs.[1] Use little bric-a-brac. No unnecessary furniture or furnishings should be included.

For the background, tan or ivory is good in a room which is inclined to be dark, or gray and gray-green in a room inclined to be bright.

A SUGGESTED LIST OF FURNISHINGS FOR THE LIVING ROOM

Floor coverings.—Carpets, rugs, or linoleum. The entire floor may be covered with carpet or linoleum in plain colors, or in an allover design. Rugs and carpets should be preferably the orientals, Wiltons, chenilles, or Axminsters. Linen fiber, wool fiber, grass fiber, wool braided, and hooked rugs are appropriate for country houses or summer furnishings. It is a matter of choice whether one large or several small rugs be used.

Table.—In any of the hardwoods or painted softwoods; square or oblong, depending on the shape of the room, such as an oblong library table, refectory, a square drop-leaf, gate-leg or plain wood table, painted.

Sofa.—Either entirely overstuffed, wood frame upholstered, or day-bed type.

Armchair.—Either entirely overstuffed, upholstered seat and back only, or upholstered seat and wooden back, such as plain overstuffed

[1] There are many other types of chairs that are more comfortable and much more beautiful, some of which can wisely be used in furnishing the demonstration home. A family furnishing a home for its own use will, of course, take into consideration the habitual comfort of its members.

velour chair, wing chair, Chippendale, or French tapestry and needlework. In any of the hardwoods; type such as Windsor or ladder-back, with wood or rush seats.

Wicker armchair.—Natural color or painted, with or without cushions.

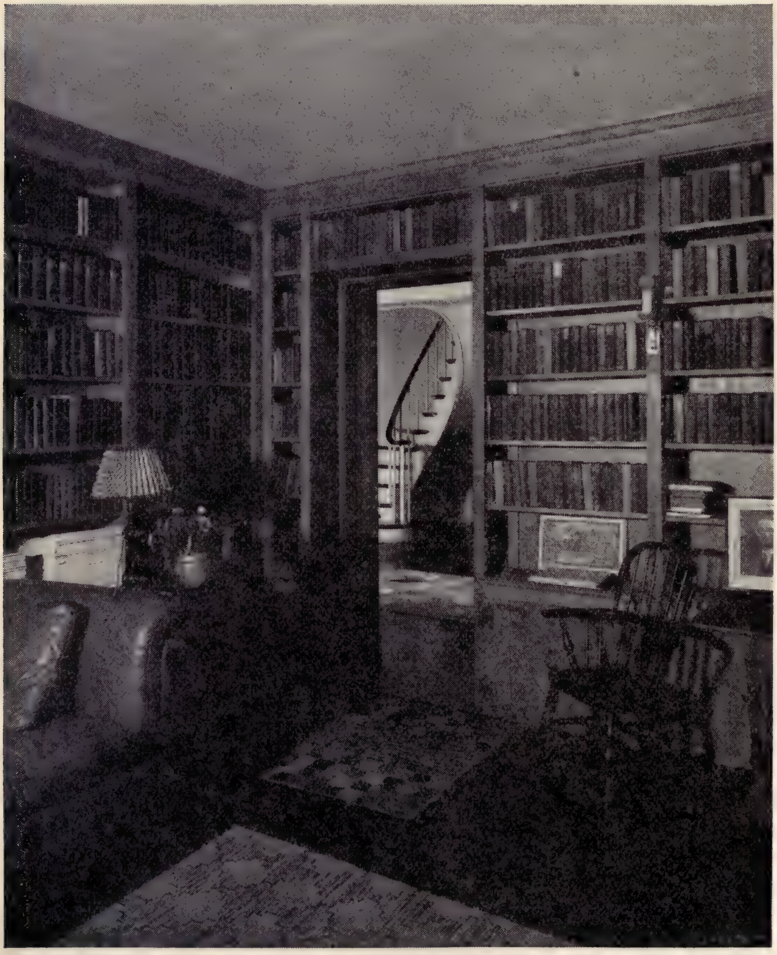

FIG. 55.—An attractive library with built-in book shelves will stimulate interest in acquiring worth-while books. (Trowbridge photographs, courtesy of *House Beautiful* magazine.)

Desk.—In any of the hardwoods; type, Colonial secretary with bookcase, above, block front, spinet, or small flat-top desk.

Desk chair.—Straight chair with upholstered, wood, or rush seat, to correspond in wood and style with desk.

End tables or stools.—In any of the hardwoods or painted softwoods; low, round, square, oblong, or kidney-shaped.

Bookcase or bookshelves.—Bookcase with or without doors; straight-line type, or built-in bookshelves, painted or stained to match woodwork.

Small tilt or stationary-top table.—Round or square in any of the hardwoods, lacquered or painted.

Lamps.—Tall, wooden, or metal reading-lamp, with silk or paper shade; a table lamp of wood, metal, or pottery base, with silk, chintz, muslin or paper shade.

Clock.—Simple design in wood, metal, or leather.

Wastepaper basket.—Wicker, wood, or fiber.

Decorative accessories.—Small footstool; pottery, brass, or copper vases; bowls, candlesticks; sofa cushions, table runners, or mats in duvetyn, velours, old brocade, heavy silks, or to correspond with materials used in overdraperies.

Desk appointments.—In silver, brass, bronze, leather, or wood. Bookends in wood or metal; ash-trays of enamel, glass, wood, brass, or other metal; library shears and smoking appointments.

Pictures.—In gold-leaf, antique gilt, or natural wood frames; subjects in oils, water-colors, engravings, etchings, or colored prints of interest to family and friends.

Piano.—Small grand or upright in any of the dull, dark-finish hardwoods; quality of tone first and forever of importance.

Fireplace (if any).— . . . . Andirons, fire-screen, stand containing pinchers, poker, and hearth brush, a woodbox or woodbasket.

Phonograph.—In console cabinet or smaller case, in any of the hardwoods chosen to correspond with the other furniture in the room.

Radio.—Cabinet or on small stand or table. . . .

DINING ROOM

The dining room should be one of the most cheerful and inspiring rooms of the house. It is the place where the family gathers to enjoy meals together, and nothing insures a better start than having breakfast in a bright and cheerful room.

If the dining room and living room are connected by a small door, the walls may be in some light, cloudy landscape paper, or in a small allover pattern in light cream, buff, gray, tan, or putty color. Blue is not recommended because blue, in large quantities, either in walls or hangings, absorbs the light and makes a room look gloomy.

Do not display china or glassware in a so-called china closet. A built-in corner cupboard, or a small mahogany or rosewood cabinet, which might hold rare bits of pottery and china, is permissible. It is far better to use the pantry shelves for china than to crowd it into a china closet. A few pieces of sterling silver,[1] such as a tea set, after-dinner coffee set, candlesticks and compote bowls, are more desirable for sideboard and serving-table display than plated ware or glass. Heavy pottery and brass make a good second choice. In the case of a Welsh dresser type of sideboard, a few rare plates, pewter or silver, may be displayed.

A SUGGESTED LIST OF FURNISHINGS FOR THE DINING ROOM

Floor coverings.—Carpets, rugs, or linoleum. The entire floor may be covered with carpet or linoleum, the same as the living room, or with one large rug, preferably in an allover design in the orientals, Wiltons, velvets, chenilles, and Axminsters. Linen fiber, wood fiber, grass fiber or wool braided rugs are appropriate for country houses or summer furnishing.

Table.—In any of the hardwoods or painted softwoods. Round or square extension, drop-leaf, gate-leg, or refectory, in a reproduction of any of the straight or curved line periods.

Chairs.—Six or eight, to match in wood and design the dining-table, or of some similar wood, or a dark painted finish of a period or style similar to that of the table.

Sideboard.—To match the table in wood and design. Or it may be an interesting old chest of drawers, spinet, low-boy, or large console with drawers.

Serving-table[2]—To match the sideboard in wood and design. Or it may be a small low-boy, a console with folding top, a gate-leg table, or a small chest of drawers.

Nest of tables.[2]—Small, square, or oblong in any of the hardwoods, or in a painted or lacquered finish.

[1] It is wise to remember that any such display accumulates dust.

[2] Should be considered as accessory rather than as necessary furnishings.

Mirror.[1]—Long, oblong, or upright in gold-leaf, antique gilt, wood, or painted frame.

Pictures.[1]—Few are necessary in a dining room. These may be in gold-leaf, antique gilt, natural wood, or painted frames; types: Oils, water-colors, etchings, engravings, or colored prints; subjects: Still life, landscapes, or other subjects of interest to family and friends.

A SUGGESTED LIST OF FURNISHINGS FOR OUTDOOR OR GLASSED-IN SUN PORCHES

Floor coverings.—Grass, rush, or fiber rugs; coco mats or matting.

Chairs.—Three or four, natural or painted wicker, plain wood painted, or the rustic type of hickory and reed.

Table.—One solid table to match design, for lamp, magazines, etc.

End-table or stool.—Wicker, natural wood, or painted, for tray of refreshments or smoking appointments.

BEDROOMS FOR ADULTS

The first requisite in furnishing a bedroom is that it appear crisp and clean. The walls, light in color, must be restful and simple in design. The woodwork may be white or ivory. Painted furniture is very popular for a bedroom because of its dainty appearance, but dull-finished mahogany, walnut, or maple bedroom furniture, in four-post or any Colonial design, with rag, braided, or hooked rugs, is charming.

When placing the bed, consider the sleepers' preferences with reference to light and cross drafts. A dressing-table is fashionable, but not so practical as a chest of drawers with a mirror above. A full-length mirror installed in a closet door, or hung in a narrow wall space, is a very desirable adjunct. Be sure to place the dressing-table or chest of drawers where the light is not reflected from the opposite window. To secure a good view, the light should be directed upon the person to be reflected, and not upon the mirror.

If one bed is used, place beside it a table on which may be placed a lamp, telephone, and small water-bottle and glass. If two beds are used, place this table between the two beds.

Washable bedspreads are more desirable than silk. Bedspreads and bureau covers may be made of unbleached muslin, bound with wide bands of plain yellow, blue, and brown—these colors overlapping one another—or plain white swiss, dimity, or a ready-cut spread of any novelty washable fabric.

[1] Should be considered as accessory rather than as necessary furnishings.

A SUGGESTED LIST OF FURNISHINGS FOR ADULTS' BEDROOM

Floor coverings.—Linoleum or straw matting; rugs, such as velvets, Brussels, Wiltons, braided, rag rugs, linen rugs, or straw matting by the yard.

Beds.—Twin beds or double bed, in any of the hardwoods, antique or modern, natural wood finish or painted; or metal bed, painted, enameled or stained. Box or woven springs; good quality mattress only should be considered, of either hair or good composition filler; two pillows, blankets, comforter, and bedspread.

Dresser.—Or a broad chest of drawers, with or without attached mirror, similar to bed in style and finish; or it may be an individual piece, antique or modern, of period design.

Chiffonier, chifforobe, or high-boy.—Similar to dresser in finish and style; or it may be an individual piece, antique or modern, of period design.

Dressing-table, toilet-table, vanity dresser, or low-boy.—Similar to chiffonier in style and finish; or it may be an individual piece, antique or modern, of period design. A flounced dressing-table is appropriate, with French or Early American period furniture, or in country houses where no period is suggested, but is a dust collector and is not recommended for general use.

Dressing-chair, bench, or stool.—For convenience at dressing-table. Same wood and style as dressing-table.

Small table or night-stand.—For bedside use. Should be of same wood and style as other bedroom furniture, or an individual piece, antique or modern, of period design.

Lamp.—Wood, pottery, or metal base, with paper or light-colored silk shade.

Sewing-table or stand.—Same wood and finish as bedroom furniture, or an individual antique or modern piece. Use to contain darning and mending materials.

Armchair or slipper-chair.—Of wicker; or low, overstuffed, upholstered in light-colored cotton or silk material.

Straight chairs.—Two. Similar to other bedroom furniture, or they may be individual pieces, antique or modern, of period design.

Mirrors.—If dresser, chiffonier, and dressing-table have no mirrors attached, mirrors with antique gilt, gold-leaf, painted or wood frames, should be hung over chests of drawers or low-boys.

Pictures.—In gold-leaf, gilt, natural wood or painted frames; subjects

may be of the more intimate type, such as family photographs, or subjects of particular interest and association to the occupants of the room.

Decorative accessories for ladies.—Toilet articles in silver, ivory, tortoise-shell, or wood. Fresh cotton in small container or bag, for guest. Lamp of wood, daintily decorated, or of metal or pottery, on bedside-table, with shade of paper or light-colored silk. One or two small pillows for comfort in reading, etc., hangers, shoe-trees, and painted or papered hatboxes in closet.

Decorative accessories for gentlemen.—Toilet articles in silver, ivory, tortoise-shell, or wood. Clothes, hat, and shoe brushes available. Plenty of coat and trousers hangers, and shoe-trees and shoe cloth available in closet.

A SUGGESTED LIST OF FURNISHINGS FOR THE GUEST ROOM[1]

Floor coverings.—Rugs, linoleum, or straw matting. Wiltons, velvets, rag, hooked, braided, or linen fiber rugs.

Beds.—Twin beds in any of the hardwoods, natural finish or painted, or metal beds painted or lacquered.

Dresser or chest of drawers.—Similar to bed in finish and style, or an individual antique or modern piece, or a painted chest.

Dressing-table or flounce dressing-table.—Similar to dresser in finish and style, or an individual piece, antique or modern. A flounce dressing-table may be made over a wooden frame or kitchen table at slight expense.

Mirror.—If the dresser and dressing-table have no mirrors attached, mirrors with antique gilt, gold-leaf, or painted frames will be necessary, hung against the wall over the dresser.

Armchair or slipper-chair.—Low wicker, painted wood, or overstuffed, upholstered in flowered or dainty material.

Chairs.—Two straight chairs, natural wood or painted, one for use at desk.

Desk.—Natural wood, flat-top, spinet, or block front.

Table.—Small bedside-table to match other furniture, with small drawer.

Trunk-rack or low bench.—Natural wood-stain or painted, for bags or trunks.

Lamp.—Wood, pottery, or metal base in some dainty unusual design or color.

[1] Many houses cannot afford a guest room. The list of appointments and decorative accessories given below will prove useful when one of the family rooms is made over to accommodate a guest.

Pictures.—Not more than three or four, in gilt, natural wood, or painted frames. The subjects should be of interest to guests.

Appointments and decorative accessories.—Note-paper, blotters, postcards, stamps, pen and ink on desk. Hand mirror, brush and comb, shoe horn, buttonhook, box of assorted dress and hair pins; dress hangers, shoe cloth, shoe pockets or rack in the closet. Small carafe pitcher or thermos bottle and glass for water; small bag or basket with threads,

FIG. 56.—Cross-ventilation, simplicity, and restfulness in furnishings are important considerations for a bedroom. Better Homes demonstration.

needles, etc. Vase or bowl in pottery or glass for flowers. A few current magazines and small books. Special rack in bathroom for guest towels and soap if there is no guest bath.

BEDROOM FOR EITHER BOYS OR GIRLS

It has been proved that furnishings and color produce either desirable or disastrous effects upon the sensitive minds of children. As all children's rooms are usually a combination of bedroom, playroom, and study, it is

well to keep in mind colors, design, arrangement, and practicality for all purposes.

To most children, a spotty or too often repeated design is distracting. Blues and violets soothe, while reds, yellows, and sometimes greens are exciting and stimulating colors.

Boy's room.—While there should be no frills, light fabrics, or woodwork for boys to soil and mar, their rooms may still be made interesting, even beautiful; but convenience and masculinity should be kept foremost in mind.

Girl's room.—A girl's room, on the other hand, should be dainty, and bright. Her personality, even at a very tender age, will clearly be disclosed by the way she cares for her room. There is no need of a great expenditure of money in buying furniture or hangings for a girl's room. Some of the cheaper fabrics and simplest furniture will make the most charming room.

A SUGGESTED LIST OF FURNISHINGS FOR A BOY'S ROOM

Floor coverings.—Rugs, linoleum, or coco matting. Brussels, velvet, braided, or rag rugs, or strips of coco matting.

Beds.—Single bed, wood or metal. If the room is shared by two boys, use two single beds, in wood or metal, preferably of the day-bed type, in dark wood, dull finish, or dark painted finish.

Dresser, high-boy, or chest of drawers.—In natural wood to match beds, or dark-painted, straight-line chest with plenty of drawers. One chest for each occupant of the room.

Mirror.—If the dresser has no mirror attached, a plain square or oblong mirror of natural wood or antique gilt should be hung low enough over the chest for the convenience of the occupant.

Chairs.—One or two straight wooden chairs to match dresser, or painted dark, such as black, green or brown, and one comfortable chair, such as a dark-painted wicker or wooden armchair.

Table.—A low one to match dresser, or painted to match chairs.

Desk.—One with sturdy, flat-top, or of craftsman type, in finish to match other furniture.

Lamp.—For desk or table, or on a bracket, with glass or stout paper shade.

Bookcase or bookshelves.—For books, trophies, etc., of simple lines to match other furniture, or shelves finished to match woodwork.

Tie-rack.—Hung near chest of drawers.

Pictures.—One or two in dark wood frames; subjects should be those of interest to boys.

Denims, reps, and heavy sunfasts make appropriate curtains, bedspreads, and bureau scarfs.

Few or no decorative accessories are necessary, as boys create their own.

A SUGGESTED LIST OF FURNISHINGS FOR A GIRL'S ROOM

Floor coverings.—Rugs, linoleum, or straw matting. Brussels, velvet, rag, braided, linen, or wool fiber rugs.

Bed.—Single bed, wood or metal. If the room is shared by two girls, use two single beds in natural hardwood, or light-painted wood or metal.

Dresser, low-boy, or chest of drawers.—In natural wood to match bed, or light-painted, bulge- or straight-front chest, with plenty of drawers; or a constructed wood chest with compartments covered with flounces.

Mirror.—If the dresser has no mirror attached, a plain square, oval, or oblong mirror of natural wood or antique gilt should be hung low enough over the chest for the convenience of the occupant.

Chairs.—One or two straight chairs to match dresser, or light-painted individual chairs to correspond with flounced dressing-table, and one comfortable chair, such as a natural wicker or small upholstered chair.

Table.—One small table at bedside to correspond with other furniture.

Desk.—Small, flat-top or closed-front desk to match other pieces of furniture.

A large box or chest.—Built-in under window, or of a cedar type that can be moved about; for clothing, etc.

Lamp.—Wood or china base, with silk, muslin, or light-colored paper shade.

Pictures.—Three or four in light-colored frames; subjects should be those of interest to girls.

Decorative accessories.—Sewing basket or stand; one or two silver, china, or pottery vases for flowers. Toilet articles in silver, wood, tortoise shell, or ivory. Desk appointments and light-colored blotter. Decorative candy-box and one or two cushions. Sateen, taffeta, muslin, seersucker, dotted swiss, and cretonnes, make appropriate materials for bedspreads, curtains, and bureau scarfs.

BATHROOM

Floor.—Should be sanitary. Tile, stone, specially finished cement, or linoleums are the most sanitary. Small black-and-white, or light blue-

and-white patterns are good. A well-filled painted wood floor of battleship gray or Colonial buff may be used. Small mats of rubber or cork at side of bathtub are desirable.

Walls.—Tile, or plaster painted with two coats of flat paint and one coat of enamel, or oilcloth wall covering. White or any pale colors are the best.

Ventilation.—Window-board should be in window to allow top and bottom ventilation if no separate ventilator is provided.

Fixtures.—Porcelain or enameled iron tub with hot and cold running water; shower with spray set at angle not to wet hair; porcelain or enameled basin, with hot and cold water; toilet with white seat desirable; cabinet, with door and mirror, over basin; shelves for shaving equipment, lotions, antiseptics, first-aid kit, etc., cupboard large enough to hold supply of towels, soap, toilet paper, and equipment for cleaning bathroom fixtures, if no closet in hall is available for these.

Clothes hamper, unless chute to bin near wash tubs is provided. Hamper should have smooth white surface. Enameled metal, wood, or wicker desirable.

Towel racks.—Nickel, glass, vitreous china, or enameled wood rack for each member of family to keep towels separate. Make certain that a separate rod is provided for guest towels.

Miscellaneous fixtures.—Two nickel, vitreous china, or enameled metal soap racks, one beside the basin and one beside or hooked to the tub, if not back in the wall. Tooth-brush rack to hold tooth-brushes, well separated. Toilet-paper basket or rack. Individual mugs or glasses for each member of the family. Shelf of glass, vitreous china, or wood covered with oilcloth is usually placed over the basin.

Stool.—White enamel, preferably. Clothes hooks on back of door, or clothes-tree.

Sash curtains of white material, fastened at top and bottom on small rods to window casement and not on window sash, so the window may be raised or lowered and privacy maintained.

Lavatory.—Some families can afford to install an additional lavatory on the ground floor to save steps. It should contain toilet, wash bowl, stool, and fixtures for accessories. It should also be as easy to clean and as hygienic as the bathroom.

[NOTE.—The equipment of the bathroom stands the same whether for one or more baths in a seven-room house or for a single bath in a three-room house. The stool and clothes hamper are the only furnishings that can easily be dispensed with.]

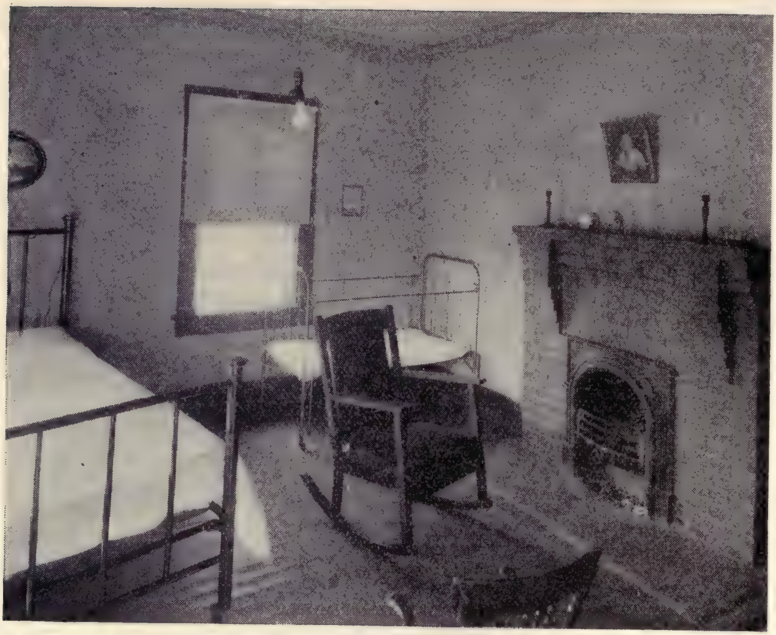

FIG. 57.—*Before.* This bedroom of a Knoxville, Tenn., Better Homes demonstration house was successfully transformed into the livable living room shown in Fig. 58.

FIG. 58—*After* remodeling

AMOUNTS AND APPROXIMATE PERCENTAGES FOR FURNITURE AND EQUIPMENT*

		Per Cent
Furniture	$1,251.50	41
Rugs	493.30	17
Linen, bedding, and towels	259.64	9
Kitchen equipment	245.53	8
Draperies	236.04	8
General accessories	189.65	6
Pictures	97.50	3
China and glass	88.50	3
Silver	86.50	3
Lamps	59.00	2
	$3,007.16	100

FURNITURE AND FURNISHINGS BY ROOM

(Budget, $3,000)†

Living room	$964.95
Vestibule	61.00
Dining room	519.00
Kitchen, lavatory, back entry	266.53
Upstairs hall	66.08
Master bedroom	614.15
Boy's bedroom	272.58
Girl's bedroom	194.18
Bathroom	48.69
Total	$3,007.16

* Based on *Furniture and Furnishings of a Better Homes Demonstration House* (a project carried on by the Department of Related Art, Home Economics Division, University of Wisconsin, 1928).

† This budget does not include refrigerator.

MODERNISM IN FURNITURE[1]

By C. R. RICHARDS
Vice-President, Museum of Science and Industry

LeCorbusier says: "Modern art, which is machine made, needs no decoration—can have no decoration." He says that the rational perfection and precise determination of machine products made solely for functional ends create in them a quality which gives them a style. I doubt that this is a final word. To my mind it represents the logical French point of view carried to an extreme that loses sight of the psychological—

[1] Adapted from "Sane and Insane Modernism in Furniture," *Good Furniture and Decoration*, January, 1929. Reprinted by courtesy of *Good Furniture and Decoration Magazine*.

that is, the aspect that demands charm, intimacy and variety in our household belongings. This question, however, we need not attempt to settle to-day. What is clear is that at present modern design in its best and sanest manifestations, as far as it relates to three-dimensional things, mainly represents an effort to express what are conceived to be sound, practical and aesthetic principles peculiarly related to modern life. Let me try to define these principles as I see them in this particular relation.

First of all, I should say modernism requires direct and effective meeting of functional needs and straightforward construction that respects the nature of material involved. These two ideas are very old. They are attributes that have characterized every high period of art, and they have been lost sight of in every decadent period. They have in particular been in the background of artistic thought for the last three-quarters of a century since Ruskin hammered upon them and reiterated them to the betterment of the world's art. Let us see why they are so peculiarly meaningful to-day.

LIVING CONDITIONS HAVE CHANGED

In what way is life different from what it was? In the first place, the physical conditions of life to-day are enormously different from what they were, and they are different almost wholly because of power and the machine. These two factors have changed the face of the earth and given us modern transportation and communication which allow people to meet and obtain new ideas as they never could before. They make possible our modern dwellings. They provide us with our clothes and our household fittings and furnishings.

Then, again, a large fraction of us live in cities where room becomes more and more at a premium. This has made the apartment house our typical living arrangement, with the constant tendency to smaller and fewer rooms. Furthermore, household service, because of higher wages and changed social attitudes, becomes increasingly difficult to afford.

All these things require that we have fewer and smaller pieces of furniture. We no longer have space for the chaise longue or for couches. We must put up with fewer great chairs or tables. What furniture we have must function effectively and its material must be used economically and according to its qualities. If one material is not fitted for a purpose, we find another. These conditions outlaw carving and deep moldings that catch dust and require constant cleaning.

On the other hand, our mental attitudes are different from those of

past generations. We live more intensely and our daily experiences are much more varied and of a transient nature. Our conversation is much more direct and simple as the demands of many brief contacts require. The flapper of to-day frankly reveals (I am not referring wholly to her dress) much that was concealed in former times.

On the whole, we face life more simply and directly, and all this tends to reflect upon our applied art. It tends, for one thing, I think, to make us less satisfied with ornament that covers up and overlies the structure of our household belongings, and inclines us to prefer the aesthetic appeal that comes from expression of the structural material itself.

We see this in contemporary furniture, silver, glass, ceramics, and in building. A potter to-day, making stoneware in the high fire kiln, almost inevitably expresses himself in terms that are the quintessence of modernism—that is, through glazes that are part of the substance of his creations. It is safe to say that over three-quarters of the pieces shown in the International Ceramic Exhibition, ... are of this character.

These, as I see them, are some of the tendencies that are present in the best of the modern work in three-dimensional things. These tendencies do not comprehend decoration in the old sense. Perhaps that will come later—I do not know. But they include, necessarily, it seems to me, scrupulous attention to appropriateness of form, firmness of proportion, elegance of line, and the discreet use of structural material for surface decorative effect. . . . .

On the continent of Europe one finds varying expressions of the modern movement. Probably in no country are there more than one or two designers producing things fine enough to have a universal appeal, but for the most part the creations are at least sane and practical.

One thing that marks much of the English, German and Viennese work is the familiar quality of the chairs. This, it seems to me, represents much good sense. When, for no earthly good reason, we try to make a chair that is entirely unlike any chair produced before 1900, we generally achieve something that is both uncomfortable to sit in and uncomfortable to look at. Why not drop this frenzied effort at mere novelty? We do not need forms never before seen. We need old forms simplified or modified better to meet present-day needs. As a matter of fact, there is much of Sheraton and of Hepplewhite and a deal of Early American that meets the requirements of modern life most admirably.

The making of furniture in any important way to-day is a matter of quantity production. Of all peoples in the world, we are the one that should, by virtue of our special genius and social conditions, best express modern tendencies. At the moment we seem to be held back by a false conception of what these tendencies mean. Many of our manufacturers are rushing in with a hope to derive benefit from a fad, but utterly failing to appreciate that true modernism in applied art is not a matter of freakishness, queerness and novelty, but an expression of fundamental tendencies in our modern life. It seems evident that the time has come for the American furniture industry to apply some real courage, some real thinking, and some real taste to this situation and to tackle the problem of working out modern expressions of furniture in terms of our own demands and tastes with a seriousness worthy of the need. It is surely not too much to say that if our furniture manufacturers and designers, instead of seeking something merely bizarre and eye-catching, would take lessons from the best of our city architecture, from our fine automobiles, from modern ceramics, silver and glass and from woman's street dress, they might in time succeed in making American furniture the finest expression of the modern spirit. A few, sadly few, of such instances of appreciation are beginning to appear. From these we may take a measure of encouragement, at least, but a fine understanding of the situation seems to come all too slowly.

SUMMARY

One of the first considerations in treating interiors is to plan for the proper relationship between the architectural treatment and the furniture. A well-designed room must have a harmonious relation between the various furnishings and the details of the architectural scheme. If there is an architect and a decorator they should collaborate.

Quantity production now makes it possible for many more families to have good furniture than in earlier days. In buying furniture utility and design are the two important considerations. Furniture woods should be properly cured or the wood may shrink, swell, crack, or warp. Modern use of veneers, plywood, inlay, and many lasting finishes all have been means of improving furniture. Lamination is the process of gluing together thin sheets of wood, layer upon layer. The abuse of veneers has brought them somewhat into disrepute, but veneer is the only means by which some of the beautiful effects in wood may be obtained. Both solid and veneer construction have many good points and certain advantages

over each other. Joinery is of marked importance if furniture is to last and give good service. In upholstered furniture correct tying of the springs is essential for durability and satisfaction.

In arranging furniture the first consideration is the space to be occupied. Usefulness and beauty are the two main essentials to be observed. Unity is produced by emphasizing one important element throughout with all other elements subordinated to it. Variety which is the element of contrast should be used sparingly. By careful selection and arrangement of furniture a room of poor proportions may be greatly improved. Color, form, texture, and contrast are effective in obtaining balance. Color is one of the most expressive elements in decoration; intense colors, however, should be used in small proportions and their use should be to add life, interest, and character to a room. Contrasting harmony is much more difficult to use than harmony of likeness but it may be made very effective. A room without design lacks individuality; "spottiness," however, should be avoided. In arranging large pieces of furniture place them parallel to walls, small pieces should be grouped according to use and attractiveness and with reference to the various centers.

Curtains are used for privacy, to regulate light, frame views, and accentuate color. Care should be exercised both in selecting the materials and in their method of hanging.

Since the hall, owing to its location, creates the first impression of the house interior it is important to strike the right keynote in its furnishings and decoration. The living-room interior, however, is undoubtedly of the greatest importance since it is the gathering place for family and friends, and should be interesting and satisfying. Light and cheerfulness are desirable results to be obtained in furnishing the dining room, and restfulness and simplicity are the chief considerations in the treatment of bedrooms.

Changes in living conditions have had their effect on the present modernistic movement in furniture and furnishings. Less space and more intense living, new use of materials, and new materials have influenced furniture design.

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CHAPTER XIII

THE KITCHEN

KITCHEN PLANNING[1]

By GRETA GRAY

Small kitchens are in general more convenient than large ones. In shape the oblong is more economical of floor space than the square and fewer steps are required in crossing the room from one work center to another. For the average family in a house of six or seven rooms, a kitchen with from 90 to 108 square feet is satisfactory. The exact size should be determined by the number of activities to be accommodated, by the size of the large pieces of equipment, by the number of doors, and to some extent by the kind of fuel used in cooking.

The chief work in most kitchens is food preparation. In addition the kitchen must sometimes be used as the family dining room, as a laundry, ... and as a playroom for small children. More floor space is then required than if it is limited chiefly to work connected with food. Even so, efficient arrangement is possible in a large, general-purpose kitchen by planning work centers for the various activities. At the other extreme is the kitchenette where every foot of wall and floor space must be utilized and sliding and drop shelves and other ingenious devices studied out to provide the needed working surfaces.

Stove, sink, table or cabinet, or both, cupboard for dishes and utensils, and sometimes a refrigerator are the large pieces of equipment for which allowance must generally be made. By careful planning such economical use can be made of walls and floor space that all these can be conveniently placed in a comparatively small area.

Two doors, one to the dining room and the other to the back porch or entry, are the minimum in the kitchens of most houses. Two or three more doors leading to cellar, pantry, and hall are not uncommon. In many cases the kitchen is made larger than would otherwise be necessary in order to provide wall space for these doors, when by forethought they could have been placed elsewhere to better advantage.

Coal or wood as the cooking fuel generally makes necessary a larger

[1] Adapted from *Convenient Kitchens*. Farmers' Bull. 1513. Bureau of Home Economics, U.S. Department of Agriculture, 1926.

kitchen than gas, oil, or electricity. A coal or wood stove takes up more room; facilities for storage of at least a day's supply of fuel must be provided in the kitchen; and the greater heat radiated from such a stove makes it impossible to work near it with comfort. . . . .

RELATION OF THE KITCHEN TO THE REST OF THE HOUSE

The connection between dining room and kitchen is of prime importance. A double-swing door leading directly from one to the other is most convenient of all. A pantry between dining room and kitchen has

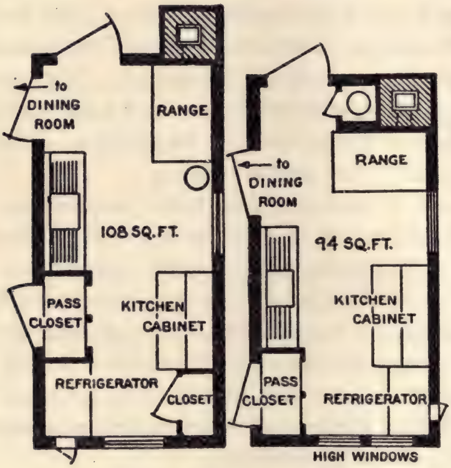

FIG. 59.—The plans above of rectangular kitchens show carefully studied arrangements. Note the easy access from range to dining room, sink to dining room, and refrigerator to pass closet. (Courtesy of the U.S. Department of Agriculture.)

the advantage of cutting off odors and noise; and if equipped with a sink and a china cupboard, table dishes and silver can be washed and stored there, leaving the kitchen free for other work. Such a pantry, however, even when narrow, does lengthen by several feet the distance to be traveled and adds another doorway between kitchen and dining room. As the name "butler's pantry" often given to it implies, it is better adapted to a large house with servants. For the small house in which the homemaker and her family do most of the preparation and serving of food, too much can hardly be said in praise of the pass cabinet as a saver of steps. . . . .

The relation of the kitchen to other centers, indoors and outdoors,

where the homemaker works herself or supervises others, is another point to consider. Laundry and furnace room, for instance, should be easily reached from the kitchen. . . . .

There should also be easy access from the kitchen to the entrance doors, to stairs to the second floor and to the cellar, to telephone, and to toilet. In a house with a center hall there can almost always be arranged a short route from the kitchen to the front door that does not lead through living room or dining room.

Is the kitchen to have the prevailing wind in winter or the prevailing breeze in summer? Is it to have sun in morning, afternoon, or throughout most of the day? What shall be the outlook from the windows? . . . . These are also important questions which should influence the location of the kitchen. The answers depend partly on climate and partly on personal preference. In a hot climate the kitchen should if possible open onto a screened porch, and in any case the outlook should be made pleasant. A trellis of vines, a hedge, or a row of Lombardy poplars are an effective screen for many undesirable features. The sand box or swing for the children can often be located in view of a kitchen window so that an eye can be kept on them at play.

KITCHEN FLOORS, WALLS, AND WOODWORK[1]

By GRETA GRAY

[Although wall and floor finishes have been discussed in general in one of the preceding chapters, the following paragraphs contain specific considerations.]

The ideal kitchen floor is durable, comfortable to walk and stand on, smooth but not slippery, easy to clean, not injured by grease and water, and attractive in color and appearance. The wooden floor finished with paint or oil or covered with a good quality of plain or inlaid linoleum meets many of these requirements.

For the walls, smooth hard plaster finished with good quality oil paint is perhaps most satisfactory. Oil paint will stand repeated washings with lukewarm suds made from neutral soap, and can be renewed easily. Wall oilcloth applied like wall paper can also be washed with fair success if water does not get into the seams. If ordinary wallpaper must be used, a coat of varnish brushed on after it is hung will help to prevent

[1] Adapted from *Convenient Kitchens*. Farmers' Bull. 1513. Bureau of Home Economics, U.S. Department of Agriculture, 1926.

steam from loosening the paper and will give it a more durable finish. The glaze on oilcloth and varnished wall paper, however, is irritating to the eyes.

A wooden strip or molding four or five feet above the floor cuts off the lower part that receives hardest wear. If painted or stained a different tone from the rest of the wall, this dado prevents differences in the two sections from showing up and the lower can be washed or refinished without making the other look shabby.

The woodwork should be plain, and there should be as little of it as possible. The baseboard especially should be designed to shed dirt rather than to form a resting place for it. Woodwork finished with the same oil paint used on the walls is economical of time and materials. Spar varnish applied after the wood is stained gives a smooth durable finish. For some kinds of wood, oil well rubbed in is satisfactory.

The color in which walls and woodwork are finished should depend on the lighting of the room and on its exposure. Light tans and grays with enough yellow to give them life are generally best because they are neutral, do not show soil quickly, and yet reflect considerable light.

KITCHEN VENTILATORS[1]

By ELIZABETH HALLAM BOHN

The variety of makes in the ventilator field might well cause the home-owner to pause in perplexity. But the principle behind them all is the same. A motor-driven fan—set in the kitchen wall or window and connected with the light socket—whisks out stale air or cooking fumes, drawing on the rest of the house for the replacing air and so maintaining a healthful circulation throughout. If a non-odorous activity—like ironing —is in progress, many of the fans will reverse obligingly and blow cool air into the kitchen fan from outside. Installation does not interfere with the opening and closing of the window.

SIZE AND SPEED

The size of the fan itself may differ in the various models. The speed with which it operates may be greater or less, to adapt the equipment to the opposing force of the wind whistling around the sixteen-story apartment house, or to restrain the electrical current to the less exacting con-

[1] Adapted from "Ten Good Kitchen Ventilators and How They Do Their Work," *House and Garden*, October, 1930. Reprinted by permission of *House and Garden*, Condé Nast Publications, Inc. (copyright, 1931).

ditions of more equable situations. Where the wall can be cut, the cabinet type can be specified by the architect and built right into the walls, leaving the entire window for its usual function. The built-in ventilator should not, if possible, be located directly under an upstairs window to draw any of the fumes back into the house again. And if it can be placed on the side away from the prevailing wind, this still further adds to its effectiveness. The rented home will welcome the easily removable portable window type of ventilator. Either simplicity or extra refinement of construction makes it possible to obtain a ventilator satisfactory for either the modest or pretentious home.

In the list which follows will be found a ventilator suitable for every need. In ordering, the size of the window must be given, if this type of ventilator is wanted; also the kind of electric current used. This latter information can be secured from the company which furnishes lighting current.

VARIOUS GOOD TYPES

One ventilator of quality, which we will call A, is built by a company of forty-eight years' ventilating experience. The guaranteed motor is the product of two eminent electrical companies. The company in question makes models for the double-hung window, the casement window, and also to build right into the wall. The portable window model is set in a double-strength glass panel, to let in all light possible. The frame is strong, attractive in its vitreous porcelain finish and easily cleaned.

The fan itself is an eight-bladed aluminum propeller of special design which handles the maximum amount of air at a minimum speed. It costs only $\frac{1}{3}$ of a cent per hour to run, at an eight cent current rate, and the ordinary size will handle 600 cubic feet of air per minute. Then there is a stronger model, handling 1150 cubic feet of air per minute. As the motor is reversible, air can be drawn either in or out, quietly and without noticeable vibration, and there is a safety-locking device to prevent accidental dislodgement of the ventilator.

Another splendid ventilator is B. This, too, will either set into the window or build right into the wall (the latter type is cleverly constructed with rattle-proof doors, operated by the lever which controls the motor). There is also a separate fan for special purposes, for the window type fits only the window which opens up and down—the so-called "double-hung" type. The fan is set into an adjustable panel of pressed steel, finished in pearl or mahogany coloring, and from the three stock panels—26″ to 36″,

36″ to 46″, and a special for the window 22″ to 26″—any size of window can be fitted out.

With this fan, a twelve-inch blade operates quietly and efficiently on about as much current as needed by a fifty-watt bulb. The improved blade design and setting direct the air forward, so that the velocity is the same at the center as at the tip. It operates at a relatively low speed and is particularly effective where there is not too great wind resistance from the outside. There is a choice of two speeds with this type of ventilator. The lower is reversible, while the higher draws the air out only.

Considerable choice in size and price is possible when one selects ventilator C, to keep the kitchen cool and up-to-date. The manufacturers of this line claim to be the only ones who guarantee their product for a full five years. These fans may be bought separately; with adjustable panel—either wood, glass or metal—for insertion in a window, or, in the wall-box type, to be built directly into the house.

ALTERNATING CURRENT

Where the fan is to run on alternating current, the 9, 12, or 16 inch size may be installed, with capacity ranging from approximately five hundred to 1575 cubic feet of air per minute. The nine-inch blade is finished in dull brass, the larger models in black enamel. If the current is direct, only the sixteen-inch fan is available. A feature of the larger fans is the speed regulating switch.

The twelve-inch fan of D sets in a metal window panel, with inserts of a translucent substance to let the light through. The smaller panel will extend to fit a window up to 34 inches wide; the wider panel accommodates a window up to fifty-inch width. This silent fan, made by a company of long established reputation, handles 625 cubic feet of air per minute with its special blade. And it may be used either as an exhaust fan or as an air intake.

E is an exhaust fan only, and may be had in set-in glass or steel panels for the double-hung window, in the transom model or in the wall-cabinet type. It may also be had without panels of any kind. The extension window panels, with their chrome plated frame and aluminum parts, fit windows of widths from 17″ to 63″, and are as easily put up as a window shade. The transom model, finished in pearl-gray enamel, is adjustable to fit transoms from 26″ to 36″ wide. The ten-inch blades of the patented propeller will pull out 800 cubic feet of air per minute. The motor is non-radio interfering, and operates with little noise.

F is a handy portable window ventilator, easily installed, being composed of two sturdy brackets which fasten to the window casing, and the frame in which the fan is mounted. It will quietly exhaust 900 cubic feet of air per minute.

G. This ventilator may be inserted in the window, its gray, white or lacquered metal panels being adjustable in three sizes, to windows ranging from 25″ to 42″. Or the cabinet type, with its one-handle control, may be built right into the wall of the new home. The manufacturers of this quiet and efficient device feature a special, insulated, slow-speed motor which will operate continuously twenty-four hours a day, if desired, without becoming hot. The fan delivers a maximum of 600 cubic feet per minute, without objectionable noise, and a variable speed regulator can be added.

H. Polished aluminum is the material of which this simple window ventilator is made. The fan has a thirteen-inch blade and is mounted on an adjustable mounting board, to fit any width of window. Neat, compact, light and rustless, it has a reversible motor to draw out or blow in the air, and can be supplied for any current.

I. Again the window, transom and cabinet models are offered in this fine ventilator. The window type is set in steel or glass with aluminum mountings, adjustable to fit windows from 17″ to 50″ wide. The transom and cabinet types are finished in soft gray enamel, the former adjustable to transoms 26″ to 36″ wide. The manufacturers claim that their ten-inch propeller will deliver 40 per cent more air than other makes—800 cubic feet per minute being its capacity. The considerable variation in prices depends on the type and kind of current used.

J. Another good type, this—economically installed in the window on its portable wood panel, or built permanently into the wall in the cabinet type. The patented fan alone may also be purchased. The white mounting panels for the window type come in three widths—36″, 42″ and 48″—while the green ventilator is either a twelve-inch fan or a sixteen-inch size. The twelve-inch can handle 750 cubic feet of air per minute; the sixteen-inch 1000 cubic feet. The manufacturers of this ventilator claim that it is the only motor-driven exhaust fan with a fully enclosed, self-cooled motor.

FIVE MAJOR REQUIREMENTS FOR KITCHEN EQUIPMENT[1]

By HILDEGARDE KNEELAND
U.S. Bureau of Home Economics

First, the efficient kitchen requires a separate working surface for each kind of work to be done. In the preparation of meals this means a separate serving table as well as the usual work table or cabinet for mixing and preparing raw foods. And in the clearing away of meals, it means separate surfaces for stacking soiled dishes and for draining. There is no place in the efficient kitchen for the general utility table, where mixing bowls and salad plates, soiled dishes and clean are jumbled together in hopeless confusion.

Second, the efficient kitchen requires the arrangement of large equipment in a step-saving sequence. The briefest analysis of the work of the kitchen reveals a repeated order of work: We collect raw food, prepare it, cook it, and serve it; we remove soiled dishes, scrape and stack them, wash, drain, and put away. This obviously gives us the key to the placing of equipment on the floor plan: For the preparing process, first the refrigerator and food cupboard, then the cabinet, then the stove, and last the serving table; and for the clearing away process, first the stack table, then the sink, then the drain board, and last the shelves for china.

In the preparing sequence, we can work either toward the right or the left, but we must end at the dining-room door. In clearing away, however, we must always work toward the left—provided we are right-handed. For each dish or utensil as it is washed is held in the left hand, and if the drain board is on the right of the sink, we must cross the left hand over the right with every piece that we put down. The only place for a sink with a right-hand drain board is in the home of a left-handed worker or in a museum devoted to displaying the tangible evidences of human folly.

Third, the efficient kitchen requires a compact working area. This means the arrangement of large equipment along the walls in a nearly continuous working surface on either side of the dining room door, leaving just enough room in the center for the worker to move easily about. It means windows placed above the work surfaces, and doors, closets and equipment not used in preparing and clearing away meals grouped at the other end of the kitchen. It usually also means an oblong kitchen, with only a few feet across from the cabinet to the sink, and a total floor space for the food work of not far from one hundred square feet.

[1] Adapted from "Abolishing the Inefficient Kitchen," *Journal of Home Economics*, July, 1929. Presented at the Tenth National Conference on Housing in America, Philadelphia, January 29, 1929.

Fourth, the efficient kitchen requires the placing of equipment at convenient heights from the floor, so as to minimize as far as possible the necessity of stooping and stretching. This is, perhaps, our most difficult problem, and one which calls for further study. For there is no agreement as yet as to the most convenient height for even the average worker, and the height which is convenient for the short worker is, of course, too low

FIG. 60.—A generous number of well-arranged built-in cupboards and drawers, a sink with drain boards, plenty of table space for work, and top space are some of the requirements for a good kitchen.

for the tall one. Since we cannot standardize the height of housewives, we must find some way of making the height of our working surfaces adjustable. Meanwhile, with the average worker in mind, we can place the sink and the worktables several inches higher than they usually are now placed.

Fifth, the efficient kitchen requires the grouping of small equipment around the working center where it is usually used first. This means the abolition of the general utility cupboard or closet and the building of shelves and other storage space in almost continuous series above and below the various working surfaces.

IMPORTANT POINTS TO CONSIDER IN SELECTING OR BUILDING LARGE EQUIPMENT[1]

CUPBOARDS

1. All cupboards should extend to the ceiling. Otherwise the top becomes a "catch all" and dust catcher.
2. Where ceilings are high there should be two doors on cupboards. The upper one should be a small door, which opens to shelves storing things seldom used. A long door is more difficult to open and taxes hinges and latches.
3. Wood panels are preferred to glass in kitchen cupboards.
4. Where swinging doors do not conveniently fit into a space, sliding doors may be used.
5. Cupboard shelves should be placed 16 to 18 inches above the work-table in the combination cupboard and worktable unit. This gives room to use the table beneath and low enough to prevent one's head bumping against the edges of an open door.
6. Cupboard shelves should not be too wide. Definitely plan their use, so that but one row of articles can be stored on them, thus preventing unnecessary reaching behind or "hunting" for articles.
7. Shelves should have an adjustable arrangement at the side so that they may be changed in distance apart to suit various needs.
8. Where permanent shelves are both too wide and too far apart an extra narrow shelf may be added to conserve storage space.
9. Cupboard shelves are easiest to clean when enameled or covered with oilcloth smoothly pasted.

WORKTABLE

1. Since more work is done at the worktable than at any other work center, the table should be placed before a window where the light is good and there is a possibility of a pleasant view for the worker.
2. The table combined in a unit with cupboards above and drawers below should be about 2½ feet wide.
3. Toe room should be provided by extending the table four or five inches beyond the line of the base, or by recessing for three or four inches the base next the floor.
4. Knee room should be provided for comfort while sitting at work by an opening under which knees and feet may be placed or by an extension leaf or board, as provided in office desks.

[1] Adapted from *Finishes and Furnishings for the Kitchen.* Iowa State College, 1929.

5. Materials for worktable tops are porcelain, enameled iron, a material which is an alloy of copper and zinc, linoleum cemented down, and composition material. Tile and composition tops are harder to clean, nonresilient and tend to chip dishes. Porcelain tops to fit any size table may be secured.
6. Providing the right height for the worker at the table is essential. If a small table is available, in addition to the cabinet unit, one height may be planned for each, to be determined by the tasks generally done at each. A simple test is that of standing before the table and, without stooping, placing the hands, palms down, over the table. The table is of proper height when the palms can be laid flat on the table without stooping. If the palms are three inches above the table, it should be raised three inches, giving the required working height. Portable tables may be raised by ball bearing casters or small hollowed out wooden blocks. One commercial firm furnishes detachable legs of different heights for tables and cabinets. To lower tables, saw off legs and replace casters.

DRAWERS AND BINS IN THE BUILT-IN UNIT

1. The space beneath the usual built-in worktable is divided into molding board, drawers, bins for flour and sugar.
2. Drawers should operate on guides to prevent binding when pushed in or pulled out. It is good construction to have a stop to prevent the drawer from going back farther than flush with the face of the unit. Drawers should not be too deep as space is likely to be wasted and are likely to cause unnecessary handling of the contents. A drawer too deep may be made more convenient by placing a movable tray on strips of wood nailed to the sides of the drawer on which the tray may rest and be pushed forward and backward, permitting the reaching of stored material below. Plan the depth of drawers to conform with their intended use. Removable partitions should be made to separate equipment.

   Drawers placed so they extend down to the floor are better than cupboards as they may be pulled out and the contents seen without stooping.

   Bins for flour and sugar may be of the dump type or metal containers resting on a platform fastened to a door, with strong hinges..

[NOTE.—A variety of kitchen cabinets recently have been developed, and kitchen assemblies of different kinds include almost everything that may be classed as kitchen furniture and equipment. These units are sufficiently large to cover the entire area between floor and ceiling and a large portion of the wall-space.]

WHAT TO LOOK FOR IN SELECTING STOVES[1]

By S. AGNES DONHAM
Specialist, Income Management

COAL RANGE

In choosing look for:

A range which is plain, with little or no nickel or ornament.

A simple, clean arrangement for removal of ashes.

A convenient opening for cleaning the flues.

An eight-inch cover is more convenient than smaller ones, and one should be sure that the oven is the size suitable for her needs.

CONSTRUCTION AND PARTS

A metal or iron box with a smaller box at the end. Some built-in ranges have small boxes at each end.

Flues.—Both boxes are surrounded by a larger box, with air spaces, called flues, between.

Fire box.—The small box opens at the top into the air space; and is divided horizontally by a grate. The top part is called the fire box.

Ash box.—The lower part is called the ash box.

Oven.—The large box, called the oven, is surrounded by air spaces on top, side, and bottom.

Water connection and lining.—Coils of pipe or metal front for water in fire box—other sides of fire box are usually lined with fire brick.

Chimney damper.—A flat plate, which when shut nearly closes the space opening into the chimney—when CLOSED the heat goes round the oven and heats it; when OPEN the heat goes directly up the chimney—the fire burns more rapidly but the oven does not heat. These dampers may usually be CLOSED in 10 to 15 minutes after the fire is started.

Drafts.—Doors or slides below the fire box which, when open, allow a strong current of air to pass up through fire; and if the chimney damper is closed the oven heats quickly. When the drafts are closed the fire burns more slowly, as most of the air is shut out.

Checks.—Slides in the small door above the fire box and in the chimney pipe which, when open, let cold air in on top of the fire, force the heat back and deaden the blaze.

Facts to remember.—There must be free circulation of air through the fuel—air spaces between the paper, wood, and coal.

[1] Adapted from *Marketing and Housework Manual* (Boston: Copyrighted by Little, Brown & Co. [1917], 1930), pp. 114–23. For information on use and care of various types of stoves see *ibid.*, pp. 113–24.

Air entering the stove under the fire causes an upward draft and makes it burn faster.

Lack of air under the fire checks it.

Cold air over the fire checks it.

With the draft and the chimney damper open, the fire burns fiercely, the top of the stove grows very hot, but the oven is not heated.

Proper use of checks and drafts will control a fire.

Ashes in the pan when you start a fire will absorb the heat at first.

When the fire has burned dull red or white the coals are exhausted—burning to white heat melts the coals, makes clinkers, and injures the top of the stove.

Clinkers may be removed by burning oyster shells or quicklime on top of the fire.

If the top of the stove gets red hot, the covers will warp.

Shaking packs an old fire down and stops the draft.

Raking from below or turning a revolving grate removes the ashes without packing the fire.

Too shallow a bed of coals won't burn well.

Coals above the fire-box lining waste heat and injure the top of the stove.

A hard-coal fire must not be poked from the top.

NOTE.—Oil burners may be installed in coal ranges, eliminating many of the disadvantages and much of the difficult care required by a coal fire.

GAS RANGE

Best.—Cabinet range with oven on the level with the eye at the side of the top cookers. There is no adequate reason except lack of space for having the oven so low that one must stoop to it. Oven should be well insulated with automatic control.

Second choice.—Same type range without automatic control.

Third choice.—Box range with oven below the top cookers.

NOTE.—*Caution:* When using compressed, artificial, or other tank gas, be sure that installation is in accord with best-known practice and follow exactly the directions for use.

Most modern ranges have oven heat regulators, which automatically control amount of gas burned, save gas and permit satisfactory results with less care and guesswork.

Some of the new stoves have "crown tops" which spread the flame, heat larger surface, and save gas.

Most ranges now have pilot lighter for top burners.

Burners should be removable so that they can be cleaned easily.

ELECTRIC RANGE

Choose standard make.

Serviced in your community.

As efficient as you can afford; automatic, semi-automatic, or without automatic control.

Remember that "features" increase the cost. Don't pay for automatic features if you never intend to use them.

Fundamentals are:

Good oven insulation.
Sufficient oven wattage.
Enough heating space on the surface.
Wiring heavy enough to carry sufficient current.

Two types.—Box range—oven below outside heating units. Cabinet—oven at side or above outside heating units. Choice depends upon:

Space available.
Height and convenience of worker.
Cost a consideration.

Finish.—

Black or colored enamel (painted).
White or colored vitreous enamel (baked on).
Small amount of nickel (or none).

CONSTRUCTION

Two types of outside cookers:

a) Open coil: Heats more quickly, burns itself clean. May burn out if liquids boil over.

b) Closed or solid type: Heats more slowly, holds heat longer, does not burn out when liquids boil over.

OVENS

Types.—

a) Without automatic features: Current must be turned on and turned off when desired temperature is reached.

b) Semi-automatic: Like above, but signals when desired temperature is reached.

c) Half automatic: Current must be turned on and dial set, current goes off when desired temperature is reached.

d) Full automatic: Dial set at desired temperature and clock set at determined time, current turned on and off by thermostat when clock registers time and dial hands register desired temperature.

Construction.—Heating units must be large enough to heat oven quickly—2,000 to 3,000 watts necessary. Ovens must have well-insulated walls and should be large enough to hold several utensils.

KEROSENE AND GASOLINE STOVE

Types.—

a) Direct burning of the oil brought to the burner by a wick. Utensils set close to the burner.

b) Oil brought to kindler of asbestos, oil mixed with air turned to vapor by heat, lighted gas carried to utensil.

c) Formation of gas by lighting a priming fluid and heating burner before fuel is turned on, gasoline usually used as priming fluid and kerosene or gasoline as fuel.

CONSIDERATIONS IN SELECTING AND PLACING EQUIPMENT AND UTENSILS[1]

THE RANGE

The choice of a range depends largely upon the cost of the fuels available in your locality. If oil must be your choice you may wish to consider an oil range with a built-in oven. The latest development in gas ranges is the use of the insulated oven, an important factor in maintaining a cool kitchen. . . . .

In some kitchens, the placement of the range is governed by the location of a flue. However, if no flue is provided, it is possible to locate the range in a more desirable position, for example, in a corner between two windows. If a range is so placed, it is possible, by opening the windows, to ventilate the range section of the kitchen with a fair degree of efficiency. Care must be taken, however, to place the windows sufficiently high to prevent a direct draft of air from blowing out the flame.

THE SINK

There is a wide choice possible when you are planning to buy a sink. You will find stain-resisting enamel in white or a variety of colors. In choosing a piece of permanent equipment like a sink, remember that the color you choose must be in harmony with the color scheme of the room and one of which you will not tire. Chromium plated faucets are in use on many of the new sinks and meet unqualified approval from house-

[1] Adapted from *Convenient Kitchens.* Good Housekeeping Institute, 1929.

keepers because they are stainless. A dishwashing sink represents a most modern type and may be obtained in white or colored enamel also.

The sink may be placed directly alongside the range. Obviously, the window above must be sufficiently high to permit installing the sink at a proper height for the worker. Another convenient location for the sink is between two built-in kitchen cabinets with a window over it, to insure proper light. This arrangement is often found immediately adjoining the dining room door.

THE CABINET

Kitchen cabinets are made either of wood or of metal; both are satisfactory and the choice between them is entirely a personal one. These cabinets also come in a variety of colors and in many different arrangements and combinations, among which you are sure to find the particular arrangement which best suits your needs.

The main work center or working cabinet may be placed directly opposite the sink and range, leaving sufficient space between it and the exterior wall for the refrigerator. Storage cabinets located at the right of the sink will provide storage space for pots and pans within a few feet of the range and also near enough to the sink to enable replacement of clean utensils without extra steps.

Another arrangement of cabinet space is one where you will find all of the cabinets assembled along one wall with a sink and dishwasher in the center, a refrigerator at one end and a broom closet at the other. This arrangement is considerably more compact and oftentimes provides greater storage area than any other arrangement. In order to realize this latter plan, it is necessary to use considerable foresight as the units invariably are factory built.

THE BROOM AND CLEANING SUPPLY CABINET

"A place for everything and everything in its place" certainly applies to the cleaning equipment of any household. Cabinet manufacturers build a special unit to accommodate this type of equipment. In this unit may be kept mops, brooms, brushes, dust cloths, the vacuum cleaner and possibly a floor polishing machine as well as cans of wax, polish, etc. . . . . A small closet in the kitchen or in some convenient part of the house may easily be fitted up to accommodate your cleaning equipment if you do not wish to purchase a cabinet for this purpose. In any case, once you have placed all of your cleaning equipment in one place you will be delighted with the convenience which it will afford.

ELECTRIC DISHWASHERS

The modern kitchen should have up-to-date equipment for washing dishes. For the new house, the obvious purchase is the dishwasher which is a part of the sink. Several types are available.

For the old house, where a new sink is not to be considered, portable dishwashers may be used. These may be installed or used in front of the sink with the swinging spout of your sink as your water supply and the sink proper for a drain. Some of these are low enough to roll beneath the sink when not in use.

THE SINK AND DISHWASHING

Many sinks now have drainboards cast in one piece with the sink. If separate wooden drainboards are used they should be kept varnished. A combination faucet for hot and cold water is very convenient. In the single drainboard sink there is a tendency to pack soiled dishes in the sink around the dish pan, and it is here that the nicking and breaking occur. If the soiled dishes could be neatly packed at the right of the worker and washed toward the left, or vice versa, depending upon the position of the dining room door, there would be no tendency to crowd the dishes in the sink and breakage is actually reduced. If there is no wall space for a double drainboard sink, a small table on casters will serve as the drainboard for the soiled dishes.

THE KITCHEN TABLE VERSUS THE SERVICE WAGON

In most kitchens, serving surface is at a premium and a small kitchen table in addition to the cabinet is therefore helpful. If casters have been put on the legs, the table can be wheeled from place to place as it is needed. The service wagon has quite a different function. When there are no servants, it is a constant help to the hostess in many ways. . . . . A service wagon should not take the place of a kitchen table, however, because it is too low in height and not stable enough. Use it as a serving table for food ready to go to dining room.

SELECTION OF COOKING UTENSILS

The most satisfactory list of kitchen utensils should include wares of each type. . . . .

The question of heat conductivity and fuel saving may have arisen in your mind as a result of the claim of some enthusiastic salesman. Under laboratory conditions it may be possible to determine some slight differ-

ence in the heat conductivity of various materials used for utensils, but under home conditions and for all practical purposes we believe there is no difference in fuel economy.

For saucepans we would recommend both aluminum ware and enamel ware. Aluminum utensils will wear for years. With the exception of the very light grade, they are very sturdy and hold their shape. They must be given constant care, however, to keep them looking well. Enamel utensils will withstand heat and ordinary usage; but will chip if given a severe blow or if handled carelessly. This is due to the glasslike coating over the metal base. Utensils of this ware are very easily cleaned.

Both iron and aluminum are satisfactory for frying. For deep fat frying kettles, select the heavy grade of aluminum or cast-iron, and for sautéing, iron, or a rather heavy grade of aluminum or sheet steel is satisfactory.

For griddles one has a choice of heavy aluminum, or cast-iron. They all are satisfactory, although the iron griddles have been the favorite for many years because they need little care.

Roasters afford a wide range of choice. Good ones may be obtained in sheet steel, aluminumware, enamelware and glassware. The material of which the roaster is made has no effect upon the results it produces; it is the method of roasting which is the important factor. It is an advantage to have a covered roaster, even though the cover may not always be used, as it will be found desirable for those meats which require a long period of cooking.

For baking purposes oven-proof glass, porcelain, earthenware, tinware and Russia iron are all desirable. Casseroles of oven-proof glass and china can be used for serving at the table.

Select refrigerator storage dishes in either glass or enamelware. For pot roasting on top of the the stove, one should select cast-iron or heavy aluminum in the Dutch oven type of utensil.

GARBAGE DISPOSAL

There are now available small covered waste containers that clamp to the waste pipe directly underneath the sink or at a convenient height for use. These swing in under the sink out of the way when not in use, and easily swing out to receive garbage. They have draining insets and thus reduce the water content of the garbage considerably. Some manufacturers include such a device in the sink installation. If the sink does not contain a sink strainer, one may be used to keep solid particles from getting down the drain-pipe when emptying waste water in the sink. The

contents of these small containers may be transferred either to a garbage can at the sink or to the larger container put out for the garbage collector. The garbage can at the sink demands regular care. Since a small amount of drained garbage is emptied into it frequently it should be conveniently opened. The foot-pedal attachment on many modern cans provides for this. If such a convenience is lacking, the can should not be placed on the floor, as this means tiresome stooping over to open and close it. It should be raised to a convenient working height on a small stand at the sink.

The incinerator is a piece of equipment which eliminates the necessity of having to bother with the garbage man and the garbage pail. It uses gas, coal or wood as the fuel. A flue or outdoor connection is absolutely necessary for the escape of odors and products of combustion. The ashes must be removed at regular intervals from the bottom. The gas incinerator is most convenient when a chute leading to it is loaded near the kitchen sink. The incinerator itself usually can be installed in the cellar.

LIST OF KITCHEN UTENSILS WITH SUGGESTIONS FOR GROUPING[1]

By KATHARINE A. FISHER
Director of Good Housekeeping Institute

This list of kitchen utensils is offered by Good Housekeeping Institute as a guide for those who are equipping their first kitchen and also for those who are adding to or replacing some of their present equipment. Wares are not specified, as those using the list may have a preference for certain wares or may wish to use several different wares according to the type of equipment. Capacities of saucepans may also have to be changed to meet individual needs, and other changes in the list will no doubt be made for the same reason. No large equipment such as worktable, range, sink, or service wagon is included on this list, nor have we included equipment for cleaning. . . . .

AT KITCHEN CABINET OR WORKTABLE

1 coffee-making device (percolator, filter, etc.)
1 set storage jars (spices, cereals, tea, coffee, etc.)
5 mixing bowls, nested, ½ pt. to 2 qt. capacity
6 custard cups or small casseroles
1 grater
1 dough blender
1 fruit juice extractor
2 standard measuring cups (1 glass, 1 aluminum)
1 set cooky cutters
2 teaspoons for tasting
2 wooden spoons, 10″ and 14″
1 corkscrew and bottle opener

[1] Adapted from "Selecting Utensils for the Up-to-Date Kitchen," *Good Housekeeping*, January, 1931.

2 wire strainers, 3″ and 6″
1 can opener
1 chopping bowl and knife
1 cake turner (if no broad spatula in cutlery set)
1 breadboard
1 utility tray
1 colander
1 rolling pin
1 potato ricer
1 set muffin pans, 6 or 8 in a set
1 flour sifter (if not part of cabinet)
2 or 3 casseroles or baking dishes, 1 qt., 2 qts.
1 egg beater
1 pair scissors
1 knife sharpener
1 set of kitchen cutlery
1 bread box (if not part of cabinet)
1 cake box (if not part of cabinet)
1 ice pick
1 step stool
2 sets measuring spoons

STORAGE CABINET

1 Dutch oven
1 square cake pan, 10″ x 10″
1 oblong loaf-cake pan, 10″ x 5″
2 layer-cake pans, 9″
1 cooky sheet, 12″ x 12″
1 griddle, 10″
2 wire cake coolers
1 food chopper
1 steamer or "waterless" cooker
1 roll waxed paper
2 or 3 saucepans (covered) 2–4 qts.
1 funnel
1 beater (whip)
1 toaster
2 pie plates, 10″
1 roasting pan, 15″ x 10″
1 saucepan, straight or convex (covered) 6–10 quarts
1 set refrigerator dishes, including one large covered vegetable container

NEAR OR AT RANGE

1 salt and pepper and flour shaker
1 potato masher
2 frying pans, 4″ and 8″ or 10″
1 double-boiler, 1½ qts.
1 basting spoon
3 lipped saucepans, 1 pt., 1½ pts., 1 qt.
1 tea kettle

AT SINK

1 waste basket
1 towel rack
1 dishpan, about 12 qt. capacity
1 vegetable brush
1 garbage can
1 dish dryer (if no electric dishwasher)

KITCHEN LINENS

6 dishcloths (if no dishwasher)
12 dish towels
12 glass towels
6 pot holders
1 case paper towels (for hands)

OPTIONAL EQUIPMENT

Although these items are listed as "optional," some of them may play a major part in many kitchens.

Household scales
1 quart measure
1 or more molds
1 tube cake pan
1 doughnut cutter
1 ice-cream freezer
1 wooden mallet
1 vegetable bin

1 deep frying kettle with basket to fit
1 fat thermometer (for deep frying)
1 candy thermometer
2 butter-ball paddles
1 bean pot
1 steam pressure cooker
1 roll parchment paper
1 heavy ice bag
1 waffle iron
1 timbale iron
1 egg poacher
1 lot paper baking cups
1 electric mixing and beating machine
1 apple corer

A DEMONSTRATION KITCHEN

The *New York Herald Tribune* has established an Institute for Women through the initiative and guidance of Mrs. William Brown Meloney. This Institute, which is sponsored by an Advisory Council of notable specialists in homemaking and child health, recently has added a new project—"The Institute Kitchen" commonly called the "Dr. Gilbreth Kitchen" after its planner. In discussing the new project Mrs. Meloney states:

> Whatever else happens in the family, it must be fed. In no home is it a simple project. America spends millions daily on food. It is one of the costly items of life, and with unwise handling one of the biggest leaks in the family pocket-book—not only in money but in health and family peace.
>
> For this reason we have not only set up a model kitchen to simplify the labor of feeding the family, but we have also made it a joy to labor therein. We have asked two of the best nutrition specialists in America to coöperate with us in the field of nutrition. . . . .[1]

THE *HERALD TRIBUNE* KITCHEN[2]

By GERTRUDE TENNYSON

Foremost in that program have been the planning, building and equipping of a labor-saving kitchen, so that our readers may have a visible demonstration of the latest principles in housekeeping technique and may carry away suggestions for the improvement of their own kitchens.

This true home laboratory has been planned by Dr. Lillian Gilbreth, the foremost home engineer in the country and a member of the Institute's Advisory Council.

It is not offered as a rigid model for all kitchens, for one of the first rules for the efficiency of any plan is that it must be adaptable, and Dr. Gilbreth's wide practical experience leads her to insist that every kitchen should be individually arranged to suit the height, tastes in decoration, working habits and pocketbook limitations of the woman destined to be

[1] From "Glorifying the Kitchen," *New York Herald Tribune Magazine*, June 15, 1930.

[2] Adapted from "Test Your Kitchen by Ours," *New York Herald Tribune Magazine*, June 15, 1930.

its mistress. In its design this kitchen has, however, demonstrated two basic labor-saving principles which can be followed in the laying out of any work place. These principles are:

1. Working surfaces adapted to fit the height of the worker.
2. The circular workspace.

No woman who has labored for even five minutes in an inefficient kitchen needs to be told that the most exhausting part of dishwashing, ironing and any other task usually done standing, is the constant bending over. It is a tragedy and a reproach that for hundreds of years feminine backs have ached so unnecessarily. Even to-day the evil is far from cured, for not all women have learned that there are ways in which kitchen equipment may be adjusted to individual heights. As the result of the work of women like Dr. Gilbreth, all up-to-date kitchen equipment will probably in time be made with easily adjustable legs, but until that time comes there are various expedients by which the housewife may meet the difficulty.

The Institute kitchen was planned for a housekeeper five feet seven inches high, since that is the height of the food expert on the Magazine staff. The desirable work level for her was found to be thirty-six inches, which was the distance from the floor to the tips of her fingers when she was standing with shoulders relaxed and elbows bent in a normal and comfortable working position. This meant that the stove, the rim of the sink, the work surface of the cabinet and the tables had to be thirty-six inches from the floor. The height of the work stool also had to be adjusted, so that when the housewife is sitting, her hands are in the same relative position with regard to the equipment as when she is standing.

Most manufacturers make cabinet and table tops approximately thirty-one inches high. This means that for the taller woman they must be raised. This can be done by means of casters, rubber-tired wheels, caster cups or more drastic measures. The legs of the Institute's stove are placed on wooden blocks; the cabinet has a built-in baseboard; the worktables are on wheels; the sink is supported by a wooden cupboard. For the very small woman these processes may be reversed, as it is possible with most equipment to saw off enough of the legs to bring them to the right height. If the sink is too high for a very short woman she should have a small wooden platform built in front of it, on which she could stand while washing dishes or pots and pans.

Dr. Gilbreth's second efficiency principle, that of circular routing, is based on a long and careful study of kitchen processes and experiments

with many kinds of kitchen arrangements to find out which plan would eliminate all the unnecessary motions. The arrangement in the Institute kitchen has been given a practical test by which it was proved that this

FIG. 61.—Circular routing of work is one of the efficiency principles of the *Herald Tribune* kitchen designed by Dr. Lillian Gilbreth.

plan had cut almost in half the number of motions required in preparing any given dish, and had reduced to less than one-sixth the amount of walking required.

The Institute is not opposed to walking and exercise for the woman of the family—far from it! But we do maintain that she should take that exercise in the open air, rather than in a treadmill round of refrigerator to sink, to stove and back again.

The test of the efficiency of the new kitchen was made with strawberry shortcake, because this dish and its twin, peach shortcake, are both fairly complicated and popular. . . . . The cake was first made in a typically haphazard kitchen. We kept a record of every motion and every step taken in this process.

Then an exactly similar shortcake was prepared in the Herald Tribune Kitchen, which has the same equipment and utensils as the other kitchen, but has them arranged for efficiency. The results of this test were so startling as to be almost unbelievable. The number of kitchen operations had been cut from 97 to 64. The number of actual steps taken had been reduced from 281 to 45—less than one-sixth!

This great gain in kitchen efficiency is based on the idea of grouping together, within easy reaching distance, furniture and equipment which are used in the same processes or in processes which immediately follow each other. In meal preparation, for example, the housekeeper starts to assemble her cooking utensils at the cabinet and cupboard. Then she assembles the foods from the refrigerator and cabinet, prepares them at the cabinet or sink, and places them in or on the range. It follows that if an arrangement can be made which will put her within easy distance of refrigerator, cabinet, sink and stove, her tasks will be greatly simplified.

When a meal is being prepared the worktable on rubber-tired wheels is wheeled over to the work center and stands there.

The housekeeper stands or sits on a high stool. From there she can reach her stove, her staple foods in the cabinet, her perishable foods in the refrigerator and her worktable. A few short steps take her to the sink. On the built-in shelves at each side of the stove she keeps utensils needed for the stove—on the left, pots and pans for boiling and frying; on the right, dishes for baking and extra bowls used to supplement those in the cabinet. The cupboards under the sink conceal a vegetable bin (placing vegetables close to where they would naturally be cleaned), a garbage container (close to the electric dishwasher which is a part of the sink) and the various cleansers and implements used for cleaning the sink. In this cupboard two little drawers hold vegetable knives and brushes.

A unique feature of the Institute kitchen is the door closet to hold cleaning equipment used in the kitchen. This is a Herald Tribune Insti-

tute invention, made especially for the model kitchen, but answers such a long felt need that it is already destined to a wide popularity. It is a curved metal pocket, fastened to the door with hinges and opening to reveal a compartment for these necessary but undecorative objects. It has places for floor mop, broom, brushes, ammonia and dusters. The outside is painted the color of the door, but the inside is enameled black. When closed the door closet extends only six inches beyond the door to which it is attached.

The housekeeper's planning desk is another crowning achievement in efficiency. It is Dr. Gilbreth's belief that the business of running a house demands a well-planned little "office" just as surely as does any business run by a man. For this reason she has designed the desk. . . . . It is a place to make up menus, to telephone market orders and to pay bills. It is 12 inches deep by 26 inches wide. The front drops to reveal a telephone and two small drawers, one for paid, one for unpaid bills. The top shelf holds recipe books and the *Herald Tribune* box of tested recipes; on the second shelf is the radio, with the loud speaker built in above. The Institute feels that the radio has a definite place in the modern kitchen, contributing not only to the happiness of the housekeeper but to her efficiency, since it enables her, without leaving her work, to listen in on much of the useful and interesting information about her job which is now being broadcast, and glorifies many of the common tasks of the kitchen by a musical accompaniment. It has long been realized that marching soldiers forget their fatigue when the band is playing. Indeed, much of our music and even our speech has evolved from the rhythmic sounds of laboring men working in unison, and the arm that beats a cake does so with less realization that it is work if the movements are timed to the beat of a waltz.

The Institute also believes that the telephone is a necessary adjunct to efficient homemaking. Personal marketing should be done twice a week, but the telephoned grocery order can never be entirely dispensed with.

The final convenient feature of the planning desk is its bottom drawer, in which is kept a small tool kit containing screws, nails, hammer, screwdriver and other implements necessary for quick repair work.

To the right of the planning desk is a drop-leaf table and four gaily painted chairs, where the family of four, for whom the kitchen was planned, may breakfast, or where the children may eat lunch while mother goes on with her work. If the architecture of the kitchen allows, this may be replaced by a breakfast nook with built-in table and benches.

The outside door is, in this arrangement, at the end of the room exactly opposite the stove. To one side of it a hanging cupboard holds the big serving dishes and everything necessary for breakfast. Under the cupboard stands another worktable on wheels, its black composition top, which is impervious to burns, the alcohol in flavoring extracts or other stains, ready to hold the serving dishes while they are transported to the stove and then into the dining room.

SUMMARY

The kitchen doubtless has become the most standardized room of the entire house. In considering the plans, the oblong kitchen is better suited for the saving of space and the arrangement of equipment than the square kitchen. Easy access from the kitchen to front and back doors, stairs, cellar, and telephone is desirable. More doors than essential should be avoided as wall space is necessary for the placing of equipment. Cross ventilation or a ventilating fan is desirable. Windows placed high provide more usable wall space, and if opened from the top they are effective in eliminating odors. Improper lighting or not enough light on work surfaces causes irritation and fatigue.

Kitchen walls and woodwork should be smooth, free from cracks, easy to clean, and attractive. There should be as little woodwork as possible, and it should be plain to prevent collection of dust. Round corners are desirable. The kitchen floor should be durable, comfortable to walk and stand on, smooth, easy to clean, and attractive in appearance.

It is well to build cupboards to the ceiling to prevent collection of dust and also to provide for plenty of storage space. A separate working surface for each kind of work to be done is desirable. Large equipment should be arranged in step-saving sequence, and each working area should be compact. Sinks cast in one piece with drainboards are preferable to drainboards attached. The design and placement of sinks, however, are usually of more importance than the material.

Equipment should be placed at convenient heights from the floor. Small equipment should be grouped around the working center where it is used. It is desirable to have cupboard shelves adjustable, not too wide, and if used with a worktable unit they should be at least sixteen or eighteen inches above the worktable. Common materials used for worktable tops are wood, porcelain, enameled iron, linoleum, and composition materials. Drawers should be planned with reference to their use; they should not be too deep and should operate with ease. The most satisfactory kit-

chen utensils include wares of each type. In selecting new utensils consider durability, design, size of family, and amount of entertaining, also uses of article and standard makes. Handles should be securely attached and able to withstand the weight, and the article should be free from crevices and difficult places to clean.

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Based on study of time spent by over two thousand homemakers.

CHAPTER XIV

RECONDITIONING AND REFINISHING WALLS, FLOORS, AND FURNITURE

HOME REPAIR JOBS

This chapter includes information only on the reconditioning and refinishing of walls, floors, woodwork and furniture, since the bulletin *Care and Repair of the House*,[1] by Vincent B. Phelan, just recently has been published. This bulletin covers those common repair jobs with which every householder is confronted. Mr. Phelan has discussed ably repair jobs connected with foundation walls and basement, exterior and interior walls, roofs, doors, and windows, weatherproofing, heating, ventilating, lighting, plumbing, and the repair of many other parts of the house. The following repair jobs which are discussed in the above-mentioned book and which were prepared for the President's Emergency Committee for Employment[2] serve as a check list for home inspection to determine the state of repair of a home.

EXTERIOR

FOUNDATION AND SIDE WALLS

1. Masonry walls with large cracks or broken portions requiring filling.
2. Mortar joints or minor cracks requiring pointing.
3. Porous or leaky walls requiring damp proofing.
4. Leakage around eaves or tops of walls requiring repairs or coping.
5. Efflorescence or scum on walls requiring acid cleaning or special treatment.
6. Cracks, discoloration, or fallen-out portions of stucco walls requiring pointing, cleaning, or restuccoing.
7. Loose or decayed boards or open joints in frame siding requiring repairs or replacement.
8. Blistering, cracking, or peeling of painted surfaces requiring repainting.
9. Replacing wall surfaces with newer or more attractive materials.
10. Grading around foundation.

[1] Government Printing Office, Washington, D.C.

[2] U.S. Department of Commerce, *Suggestions for Possible Repairs and Improvements in the House and Its Equipment.* Washington: Government Printing Office, 1931.

WINDOWS AND DOOR FRAMES AND SASH

1. Window caps requiring new flashing or repairing over existing joints.
2. Holes or cracks around window frames requiring caulking or repairing.
3. Broken glass panes requiring replacing.
4. Defects in putty around panes requiring reputtying or patching.
5. Windows needing washing.
6. Overhauling screens in readiness for next spring.
7. Need for storm doors and windows or painting and repairing existing ones.
8. Repairs to blinds and shutters.
9. Need for awnings or repairs to existing ones.
10. Loose or shabby balconies and railings requiring repairs or painting.
11. Advisability of additional windows.

ROOF, FLASHING, GUTTERS, AND DOWN SPOUTS

1. Broken, loose or missing shingles, slate, tile, or other material requiring replacement or repairs.
2. Metal or roll roofing with cracks, open joints, or worn off coatings requiring application of water-proofing materials, painting, or replacing.
3. Rusted or defective flashing requiring painting, repairs or replacement.
4. Leaky gutters or conductor pipes requiring repainting or replacing.
5. Leakage around skylights requiring repainting of the frames, glazing, flashing, or repairing.
6. Leakage around scuttles, trapdoors, or other roof openings requiring flashing, painting, or repairs.
7. Defects in chimney requiring pointing or replacement of brick.
8. Need for chimney cap or chimney pots.
9. Ineffective draft may require lengthening the chimney or applying metal hoods.
10. Adjustments or repairs to radio antenna, lightning arrestors, or weather vane.
11. Providing splash blocks at outlet end of down spouts, or connecting down spouts to drainage system.

PORCHES AND STEPS

1. Decayed column bases requiring repairing or renewal.
2. Broken, loose, or missing balusters requiring repairs or replacements.

3. Broken or loose railings needing repairs or strengthening.
4. Decayed, broken, or loose floor boards requiring repairs.
5. Decayed or inefficient floor supports needing replacements or strengthening.
6. Broken, loose, or worn steps requiring repairs.
7. Advisability of installing lattice work to hide open spaces under porch.
8. Advisability of enclosing porches with glass or screening.
9. Need for floor paint or general repainting.
10. Open joints or cracks in masonry requiring pointing.
11. Broken or loose floor tile or other masonry material requiring repairs.

GARAGE

1. Advisability of applying insulating material.
2. Repairs to roof, doors, and windows.
3. Advisability of laying concrete floors.
4. Advisability of installing pit for servicing of car.
5. Advisability of installing heating equipment.
6. Necessary painting.

GROUNDS

1. Walks and driveways; new, additional, and repair.
2. Fences, trellises, and lattice work requiring repairing or painting.
3. Weeds, brush, and tree stumps requiring removal.
4. General cleaning up of premises.
5. Advisability of additional landscaping.

INTERIOR

THE BASEMENT

1. Large cracks or broken places in foundation walls requiring filling.
2. Smaller cracks or mortar joints in walls requiring pointing.
3. Dark walls and ceiling needing white coatings to brighten the basement.
4. Leaks through the walls or floor requiring waterproofing applications or provisions for drainage.
5. Cracks between wood sills and walls requiring caulking.
6. Spaces between floor joists as the sills and holes around pipes requiring fire stopping.
7. Floor joists sagging or warped, requiring additional support or bridging.

8. Basement floor badly cracked or disintegrated, requiring repairing or new topping.
9. Need for partitions to provide special space.
10. Desirability of ceiling and wall coverings to obtain finished rooms.
11. Floor painting or treatments to improve appearance.
12. Shelves, closets, cupboards, bins, etc. for stoppage purposes.
13. Clean basement and put things in order.
14. Advisability of constructing basement garage.

HEATING AND VENTILATION

1. Clogged smoke pipes or flues requiring cleaning.
2. Boiler coils or baffles requiring cleaning.
3. Grates warped and broken requiring replacement.
4. Cracked fire box requiring repairs.
5. Boilers with cracks or leakages requiring repairs or new parts.
6. Cracks in chimney masonry requiring pointing.
7. Woodwork adjoining pipes and heating system requiring fire protection.
8. Coating on boilers requiring patching or recovering.
9. Heating pipes requiring covering or repairs to existing covering.
10. Advisability of installing automatic stokers, ash conveyors, or similar labor-saving devices.
11. Leaky radiator valves requiring repacking.
12. Installation of additional radiators if needed.
13. Proper painting of radiators to increase efficiency.
14. Need for radiator covers and radiator tops.
15. Installing thermostatic heat control system.
16. Providing humidifiers for air conditioning.
17. Advisability of building a fireplace.
18. Putting in ash dump for fireplace.
19. Installation of additional room heating device in existing fireplace.
20. Repairing or replacing of fireplace screens, andirons, and similar equipment.
21. Installation of gas or electric log or similar heating apparatus.
22. Repairs to hearth, fireback, dampers, etc. in fireplace.
23. Remodeling of mantle or fireplace front.
24. Installation of ventilating devices in kitchen.
25. Providing insulating material to walls or ceilings where possible.

PLUMBING

1. Clogged drains needing attention.
2. Leaky faucets requiring washers, tightening, or new parts.
3. Defective flush valves in water-closet requiring repairs or replacement.
4. Covering for water pipes or other precautions to prevent freezing.
5. Installing refrigerator drainpipe and trap to replace pan.
6. Installing additional shut-off cocks or valves.
7. Installing water-heating equipment, water softeners, etc.
8. Replacing worn-out piping with more modern type.
9. Replacing old or worn-out fixtures with newer types.
10. Providing additional bathroom, or lavatory and toilet for convenience.
11. Providing toilet and shower in basement.

LIGHTING AND POWER

1. Rewiring with modern system to reduce fire hazard.
2. Exposed wires requiring insulating.
3. Renewal of appliance cords.
4. Installation of additional convenience outlets, such as floor and base plugs.
5. Additional fuse plugs for fuse box.
6. Repairs to doorbells or buzzers.
7. Installing transformers for bells in place of batteries.
8. Additional bells for convenience.

DOORS AND WINDOWS

1. Sticking doors or windows requiring refitting or repairs.
2. Doors out of plumb requiring refitting or new hardware.
3. Advisability of replacing wood panels with glass in doors.
4. Defective locks, chains, or bolts, requiring repair or replacement.
5. Purchasing extra keys for various locks.
6. Broken or defective window cords and pulleys needing replacement.
7. Replacing broken window latches or other window devices.
8. Cracks around window sash and doors requiring weather stripping.

WALLS AND CEILINGS

1. Cracks or holes in plaster requiring patching or replastering.
2. Installation of partitions, either temporary or permanent, to provide additional rooms or closets.
3. Removal of partitions to afford additional space.

4. Replacing narrow doorways with plastered arches or similar larger openings.
5. Refinishing or redecorating—painting, papering, calcimining, etc.

FLOORS

1. Creaking floors requiring renailing, additional supports, or bridging to stiffen joists.
2. Cleaning and refinishing.
3. Applying new flooring over old.
4. Repairing or replacing floor coverings.
5. Adjusting or replacing baseboard and molding moved out of position by shrinking or settling.
6. Replacing or repairing broken tile.

STAIRS AND STAIRWAYS

1. Creaking stairs requiring attention.
2. Replacing worn-out treads on stairs.
3. Providing rubber or composition treads for slippery steps.
4. Rickety cellar stairs requiring additional supports or repairs.
5. Installing railing on cellar stairs to prevent accidents.
6. Transforming closed stairways into open stairways by removing one or more walls.
7. Replacing old posts and railings with modern types.
8. Installing disappearing stairs to attic.

THE ATTIC

1. Need for insulation materials applied to walls, floor, or underside of roof.
2. Installation of louvers or additional windows to provide ventilation.
3. Mortar joints in chimney requiring pointing.
4. Cracks between chimney and side walls requiring filling or covering.
5. Fire stopping between studs at floor line.
6. Application of wall and ceiling coverings to provide finished room.
7. Installation of partitions.
8. Applying flooring.
9. Clean attic and put things in order.

MISCELLANEOUS

1. Need for additional closets, and lining existing ones.
2. Need for shelves, bookcases, and cupboards.
3. Advisability of providing clothes chute, telephone cabinet, and other built-in conveniences.

PREPARING OLD WALLS FOR NEW FINISH[1]

A good rule to go by is to remove every particle of the old finish whether it be wallpaper, cold-water paint (calcimine, alabastine, etc.) or oil paint if the latter shows any sign of peeling.

1. TO REMOVE COLD WATER PAINTS

Tools needed.—A good, wide whitewash or calcimine brush; a 3-inch-broad knife; two buckets of warm water; a large old cloth or old newspapers to protect the woodwork and floor; two stepladders or horses for holding the plank on which the worker will stand; a large sponge or cloth. Spread either old cloths or newspapers to protect the baseboard and floor. Arrange plank on horses or stepladders placed over this protecting cloth.

Wet the walls with warm water using the calcimine brush. Now wash off the old finish using either a cloth or sponge. Change the water often so that the wall is left clean. Use the large sponge, wiping from the top downward to clean all the old finish off the wet space. If there is alum in the calcimine, the finish will have to be scraped. . . . .

2. TO REMOVE OLD WALLPAPER

Wet all of the paper in the room, using the brush and clean warm water. . . . . If there are two or more layers of paper, wet the entire surface and scrape off the top layer and then proceed in the same way with each layer unless all comes off easily, at the same time. Wet thoroughly first, as time and energy will be saved and there will be less injury to the walls.[2]

When the paper is thoroughly wet, use the broad knife for removing the paper. . . . . (If the paper dries too quickly, try adding ½ pint of glycerine to a pail of very warm water.) . . . . Work from shoulder level downward, and from same level scrape upward.

Steps in scraping off varnished paper.—Remove all of the varnish from the paper by rubbing with No. 2 sandpaper. Thumb tack a good-sized piece over a block which can be easily held in the hand. Mix one pound of soda in a pail of warm water. Instead of using plain warm water, now wet the wallpaper with the soda-water mixture. Be very careful to protect all woodwork and the floor when using this soda-water mixture, or you will have a white spot every place a drop of this water touches the finished

[1] Adapted from *Home Management* (mimeographed circular). New Jersey State College of Agriculture.

[2] For wall finishes see chap. 11.

wood. In case the paper had received several coats of varnish, it may be economical to use a "paint and varnish remover" if the No. 2 sandpaper does not wear through all of the coats. If "paint and varnish remover" is used, be sure to follow the directions for the care of the wall after its use as given on the container.

Now proceed to scrape off the wet paper just as if there had been no varnish on it.

3. TO REMOVE OIL PAINT FROM WALLS

Tools needed.—Your 3-inch-broad knife; cloth or newspapers for protecting woodwork and floor; stepladders or horses; No. 2 sandpaper; warm water; soda ($\frac{1}{2}$ pound to 1 pail warm water).

Steps in removing oil paint.—Where the old coat of paint has peeled in just a few places, scrape these spots with the broad knife until all loose paint has been removed. Sandpaper these bare spots and the edges of the old paint around the spot. Paint the spots and allow to dry thoroughly, at least 48 hours. When thoroughly dry, smooth the joining edges, using fine sandpaper and then give the entire wall a coat of washable paint. For a good finish, sanitary and easily cleaned, give the wall, after the first coat has thoroughly dried, a coat of eggshell gloss or any paint that is prepared by a reliable manufacturing concern and guaranteed to give you a dull-finished, washable wall surface. If the finish seems perfectly good with no peeling or any sign of it, we may wash the wall with warm water and a mild soap to remove all dirt and grease and then give it a coat of paint immediately over the original coat. Where the wall is greasy, add four tablespoonfuls of washing soda, while the solution is warm, and wash off all dirt and grease, rinse with clean water and allow to dry.

Treatment of Walls from Which All Old Finish Has Been Removed

1. FILLING HOLES AND CRACKS

In the case of many old walls, large cracks or breaks in the plaster have to be cared for. It is wise to remove or cut out any *loose plaster* with the edge of the broad knife. With the brush and warm water, wet thoroughly the new edges from which the loose plaster has been removed. Take a quantity of Plaster of Paris, put it into the center of a good sized board; build it up into a cone with the thumb and fingers; make a hole in the center of this pile; using the handle of the broad knife, pour in a little

water allowing it to soak into the plaster. Use the wet plaster from the center of this pile and pack it into the cracks and holes. Smooth this patch even with the wall, before the plaster hardens. Use the broad knife for this work. . . . . By pouring the water into the center of the cone and using just the amount of plaster that is wet, we prevent the too rapid hardening of all the plaster. Should any of the plaster drop on the woodwork or fixtures, wipe it off immediately, using a sponge and clean water. Be sure that the Plaster of Paris patch is packed in closely and built up

FIG. 62.—With information on methods of preparing walls for new finishes and methods of refinishing, satisfactory results may be obtained. The illustration is a Better Homes project.

until the edges are even and the new work level with the old plaster wall. Should the plaster dry before it has been smoothed sufficiently, wet the patch with the calcimine brush and smooth with the broad knife.

2. VINEGAR WASH

Where soda water was used (as in the case of varnished wallpaper) the wall must be sponged off with vinegar water. Be sure to use cider vinegar. This is a treatment that should be given to new plaster where it is desired to use paint or wallpaper very soon after plastering.

3. SIZING THE PLASTER WALL AFTER THE REMOVAL OF OLD FINISH

Supplies needed.—½ lb. painter's glue, cold water, 4 quarts *boiling* water, No. 2 sandpaper, brush.

After all paper or cold-water paint has been removed and all cracks and holes have been filled, the new plaster in the holes and cracks must be allowed time to dry thoroughly. Soak the painter's glue until it is soft, in enough cold water to cover it. Pour off the surplus water. Now pour on the glue 4 quarts of boiling water (be sure it is boiling). Sandpaper the wall using No. 2 sandpaper. Use the calcimine brush and apply the glue water (size) to the wall. Brush it in thoroughly and evenly. Wipe any glue-size off the woodwork before it dries, using a damp cloth or sponge. When the glue has dried thoroughly, the wall is ready for either oil paint or wallpaper as a finish.

Preparation of the Plaster Wall for Painting

For the best result, allow the newly plastered wall to dry at least six months. Wash the plastered wall with strong vinegar water if the wall is to be painted before that time. Cover up small fine cracks and any porous spots by giving the walls a coat of glue-size, when it has dried. Brush the size on the cracks by using a sponge, thus preventing the size from settling in the cracks and showing as a dirty looking streak.

Preparation of a Painted Wall for Papering

Tools needed.—No. 2 sandpaper, ¼ lb. washing soda, stirring stick, 4 quarts of warm water, brush, old cloths or newspapers, glue water, 1 quart molasses.

Treatment of the wall.—Mix the soda in the water (¼ lb. to 4 qts. warm water). Be very careful to protect the woodwork and floor. Use No. 2 sandpaper over the whole wall surface. Go over the entire wall with the soda water, using the calcimine brush. The sandpaper and soda water break the hard, smooth surface of the paint which would be impervious to the paste which must be used to hold the wallpaper to the wall. Wash with vinegar water. When the wall has dried after the vinegar wash which followed the soda wash, go over the entire wall with the glue-size. In order to insure a good coating on the wall, add one quart of molasses or two pounds of brown sugar to the glue-size when making it for a wall that is to have wallpaper put on. Brush the glue-size on thoroughly and evenly.

Test before papering. Take a small piece of wallpaper and the paste to be used and press it to the sized wall leaving the corners free. After a few minutes remove it. If it pulls off easily and without tearing, the size is too thin and should have more glue added. If the paper sticks tight, the glue is of proper consistency.

Preparation of a Wall for Oilcloth Covering

Walls must be perfectly smooth and dry. Give a coat of hot glue-size. Allow to dry thoroughly. If this coat does not show on the surface of the wall, give a second coat of glue-size. Oilcloth covering does not need a plaster wall for its use. It can be tacked directly onto wooden walls. It comes forty-eight inches wide and thirty-six feet in length, when made especially for use as a wall finish.

HOW TO FINISH INTERIOR WOODWORK[1]

Good practice or proper finishing of the woodwork means: The right way of doing the job and the use of correct material, which means a longer-lived finish and one that costs less in the long run.

KINDS OF FINISH

1. Staining
2. Varnishing
3. Enameling and painting
4. Waxing

For soft gray effects, white oak, white birch, and ash are the best to use.

Painting and enameling are most adaptable to birch (because of its hardness and close-knit grain), white pine (because of the fact that it is free from resin), poplar, and gumwood.

PREPARING THE SURFACE

The general preparation of the surface is very much the same in all finishing. There are certain precautionary measures to observe in order to insure a good clean finish which the careful finisher looks after instinctively. The number of tools necessary to have at hand for the best results is not burdensome, and the number of precautionary measures referred to is not formidable, but both are essential.

[1] Adapted from *Interior Woodwork for the Home* (mimeographed circular). Montana State College of Agriculture.

Someone has said that the principal cause for difference in the finish of the piano and the average woodwork job is sandpapering. Sandpaper the wood smooth—and then take finer sandpaper and sandpaper it again! Do not apply any finish over a poorly prepared surface. All sanding is to be done with the grain. Scratches are bound to show if sanding is done across the grain.

For rough sanding, No. ½ sandpaper is best; for finishing the wood, No. oo is generally satisfactory, but for sanding enamel undercoats and varnish coats, No. oooo is the best grade to use. Good emery cloth or carborundum sandpaper will outwear ordinary sandpaper considerably and cut cleaner. Always dust the surface thoroughly after sandpapering.

Painters often use a dust brush to remove any dust which may have settled on ledges or on corners. Every particle of dust that is varnished or enameled over becomes greatly magnified in size. Before varnishing or enameling, the surface should be gone over carefully with a cloth, dampened with benzine.

1. STAINING

There are three types of stains used for woodwork finishing—acid or water stains, penetrating or spirit stains, and pigment or oil stains. The first type is generally used by piano and furniture manufacturers because of its permanency. Acid stains are designed for hard woods only, and as they raise the grain and therefore require to be sanded smooth again before finishing, many prefer to use the spirit stains, which do not raise the grain. Spirit stains may be used on both hard and soft woods. Oil or pigment stains require the wiping off of the surplus stain, but this disadvantage is offset, in the opinion of many, by one's ability to govern the depth to which the stain shall penetrate. In all cases, in staining, follow the directions given on the package as to how to reduce and apply each stain. These stains are all indicated to be used over the new wood, before the wood is filled.

Most stains require sealing with shellac before varnishing or waxing. This is done to prevent the stain "bleeding" into these finishing coats. As a rule, pure-white shellac is to be recommended, as it does not change the color of the stain as does orange shellac. A very thin coat of shellac should be applied (shellac reduced with denatured alcohol) and, with open-grain woods, may follow or precede the application of the paste filler as directed on the package in each case.

As previously indicated, open-grain woods require the use of a paste

filler to level the surface for a varnish finish. These fillers come in paste form and are thinned with benzine to the consistency of heavy cream. They may be had in several colors. The so-called transparent, or natural filler, is intended for use for natural wood finishes. Some of the darker fillers contain a considerable amount of dye and really stain the wood to a degree. For light finishes some contractors effect a short cut by filling and staining the wood in one operation instead of two, depending upon the filler for the coloration of the wood. Of course where only light tints are to be applied to the wood. Such effects as antique mahogany and others need the full strength of the separate stain coat. A word about liquid fillers: A liquid filler is usually a quick-drying varnish or shellac with a pigment in it.

A word about liquid stain fillers. A liquid stain filler is usually a quick-drying varnish or shellac with a pigment in it. Whereas a paste filler actually goes into the pores and fills them, the liquid merely forms a shell or crust over the wood without actually filling it. Being brittle, this material chips off under service, and, of course, brings the finishing coats with it.

The application of the paste filler is as follows: After thinning to brushing consistency with benzine, brush it over the entire surface, and when the material has begun to set (indicated by a partial flatting out of the gloss), wipe off. First rub across the grain with burlap or coarse cloth, forcing the filler into the pores through it, and then wipe the wood clean by rubbing with a clean soft cloth, with the grain. Paste filler should be permitted to dry two days before applying the finishing coats. On all woodwork trim, this filler should be followed by a thin coat of shellac. When this is hard, sandpaper lightly with No. 0000 sandpaper. It may then be waxed.

2. VARNISHING

At this point, many builders apply a coat of dull drying varnish. One is amply repaid, however, in the added beauty and life of the finished product secured by applying one, or better, two coats of a good furniture varnish before finishing with the dull varnish. These two coats of varnish should be sanded carefully with No. 0000 sandpaper.

The right brush is half the battle, for in varnishing and enamel work a fine brush will enable one practically to avoid showing brush marks. A Russian oxhair or fitch brush is ideal.

APPLYING THE VARNISH

For enameling or varnishing, apply the varnish quickly and freely, with the grain of the wood. Now without filling the brush, stroke directly across the grain. This will help spread the varnish or enamel in an even film, making up for any thin spots missed in the first application. Now scrape the brush fairly dry, over the edge of the varnish cup, extending the brush strokes, if possible, from one edge to the other without a break, to take up any surplus varnish which would otherwise run and make sags. Try to choose a clear, dry day for varnishing and enameling.

In applying shellac, one cannot brush back into the surface as with varnish. Shellac sets very quickly. The alcohol evaporates very quickly and so shellac may, upon use, be found too heavy for proper brushing for this reason. It should then be thinned with denatured alcohol.

DULL-RUBBED FINISH

Dull drying varnish is intended as a representation of the true, hand-rubbed dull finish. Powdered pumice stone is used for this rubbing. Rubbing with oil (regular rubbing oil or good sewing-machine oil) produces a dull effect, while rubbing with water is the first step toward producing the high polish.

A piece of rubbing felt an inch thick is best, but if this is not available, make a pad of a piece of firm, soft cloth. Place both the oil and powder in open dishes. Dampen the cloth or pad with oil and dip into the powder. A dozen or more strokes with the grain of the wood will usually dull the gloss of varnish or enamel satisfactorily.

A word of caution.—Do not rub too hard or too long in one spot, as rubbing has a tendency to soften the finish. Also, avoid hitting the edges of the surface, as they seem to rub through instantly. A small vegetable brush is the best tool to reach the corners and molded surfaces or carving. Dip it in the oil and powder the same as the pad. Wipe off the oil with a soft, dry cloth, wiping with the grain.

3. WAXING

If the woodwork is to be finished in its natural color, first apply a paste wood filler, if it is an open-grain wood, then put on two thin coats of wax according to directions with the product. If the woodwork is to be stained, apply the stain, then the paste filler (if the wood is open grained) and two coats of wax. If the wood is close grained then apply the shellac after the stain (as shellac is a liquid filler). Then apply two coats of wax.

4. ENAMELING AND PAINTING

Birch is the best wood to take paint or enamel, as it is very hard and does not dent or bruise readily. Poplar, pine, and gumwood come next. When it is necessary to paint or enamel over these last-named woods, it is advisable to seal the wood with shellac before proceeding with the first coat of paint. The first coat of paint—either flat tone or bright—applied over the shellac should be thinned about 10 per cent with pure turpentine; the second coat should be thinned slightly, and the third coat applied as it comes from the can. Rub down each coat of paint with No. 0000 sandpaper before applying the next coat of paint or enamel. This makes a smooth, hard-paint finish. Over the last coat of paint, if desired, a thin coat of enamel may be applied, and finished with a second coat of enamel just as it comes from the can. This latter gives a shiny, brilliant finish unless rubbed down with powdered pumice and moistened with olive oil. Enamel may be purchased with semi-glossy or egg-shell finish.

HOW TO REFINISH OLD WOODWORK

A. To prepare old surfaces
   1. If the old coats are not worn off or chipped in spots, then thorough cleaning followed by sandpapering with No. 00 sandpaper will suffice.
   2. If, however, the old coats are worn or chipped badly, then all the old coats should be removed before refinishing. This can be done
      a) Mechanically, by scraping with a sharp blade or by sandpapering, or
      b) Chemically, with a commercial paint, stain or varnish remover, or with a home-made remover, as follows: Add 2 tbsp. lye to 1 qt. warm starch solution (as for starching clothes). Apply with a vegetable fiber brush or cotton mop. Let stand several minutes or until the old coats are softened. Then scrape or rub off. Rinse well. Then bathe with a vinegar solution (3 parts vinegar to 1 part water) to prevent any of the lye remaining to damage the new coats of finish. Rinse well and dry thoroughly, then sandpaper smooth and wipe off dust before applying new coats.

B. Refinishing
   1. When restaining old woodwork, cover the wood thoroughly with a paint and varnish remover, taking care to wash out as much of the old stain as possible. As there will be some stain remaining in the wood, this must be reckoned with in restaining. A wood previously stained in mahogany should be stained with mahogany again or in one of the darker browns. The spirit stains, because of their penetrating qualities, are the only stains which are effective for refinishing work. Woods previously stained

green will be best finished in either green again or in a weathered oak. Previously finished woods in natural colors do not present these difficulties. Because the color of the wood may be darker and more yellow than the original wood—due to ageing—silver gray effects will not be as clean in tone as might be desired. After restaining, use the paste filler, then the shellac for a binder, varnish, and rub or dull the finish as for new wood.

2. Revarnishing. See A: To prepare old surfaces.
3. When rewaxing woodwork, use a commercial brightener or liquid wax, which cleans as well as polishes. Or turpentine or gasoline may be used before rewaxing.
4. To repaint or re-enamel. See A: To prepare old surfaces.

REFINISHING OLD FLOORS[1]

By MARION BELL

In many sections of the country to-day, the housewife is confronted by a very perplexing problem. The refinishing of her floors has become a necessity. In this case the wood, its former treatment, and the new finish decided upon for it will determine the method of procedure. For years the floors may have been painted, varnished, waxed, oiled, or used without a finish of any kind. This last necessitated weekly scrubbing. Each one of these finishes brings up its own problem of daily care and its renewal.

PREPARING THE SURFACE

If, upon examination, the old covering of paint or varnish is found to be in too bad condition to permit of "touching up," then all of the old paint or varnish must be removed. There are a number of methods by which this may be done. The one selected by the housewife will be largely determined by her location and the amount of money to be put into the work.

a) An electric planing machine will remove all finish and leave the floor in practically the state of new wood.

b) A workman may be employed who will scrape off all the old paint or varnish by means of a sharp-edged tool and then sandpaper the surface smooth. In this case your wood, if open-grain, probably retains enough of the original filler to need no new filler and you can treat it as you would a new floor that has been carried to this step in the process of finishing.

c) A prepared paint and varnish remover can be purchased from a reliable dealer. Use according to the directions on the package.

[1] Adapted from *Floors—Their Finish and Care.* Extension Bull. 49. New Jersey State Agricultural College, 1925. For further information on floor finishes and coverings see chap. 11.

d) A number of different materials are recommended as being successful and inexpensive in the removing of paint or varnish from wood. Among these are ammonia, alcohol, washing soda, and potash (lye). The first and second are very slow for work with a large surface, washing soda is a little more rapid, but the quickest and easiest material is potash, which any housewife can buy in different size cans at her grocery store under the name of "lye." Use in the proportion of one pound of potash to six quarts of cold water. Use rubber gloves and overshoes to protect the hands and shoes. Take an old broom, cut the edges straight, and use it to apply the lye-water to the floor.

The equipment needed for this work is a scraper and plenty of old newspapers. Begin in the corner farthest from the door. Have a mop and bucket of clean water (with wringer attachment). Work with a small space at a time—about three or four square feet. Apply the lye water and allow it to stand until the paint or varnish softens (which is easily seen). Scrape off with the wide, sharp-edged hoe or other tool. After all of the old finish has been removed, wash the floor thoroughly, making the second water strong with vinegar, and following this by a final wash with clean, warm water. When the floor is dry, sandpaper it smooth. This can be done rapidly if a weighted block is made and the sandpaper held in place on it by means of thumb tacks. Fasten a handle to this block if possible. This sandpapering insures a smooth floor; it also guarantees the removal of all lye from the wood. If any lye remains, it will begin its work the instant any new paint or varnish is applied. When the floor is clean, it should then be treated like a new floor. It will need "crack and crevice" filler in case the boards do not fit well together.

A prepared "crack and crevice" filler may be purchased from any reliable paint store, or a very good filler may be made at home. Mix one part of turpentine and three parts of linseed oil (boiled preferred). Into this stir enough whiting to make a paste of the consistency of cold cream. This filler will be quite light in color. If the crack filler is to be applied to an oak floor, add a little yellow ochre and just a very small amount of burnt umber, in order to match the oak color. Clean all dust out of the crack. With a small brush apply varnish to the sides of the flooring. Pack filler into the crack. With a spatula smooth the surface even with the floor while the filler is soft.

REPAINTING

If the paint is worn off so that the wood shows in many places in the room, all of the paint should be removed as described in the preceding paragraphs. If it is worn slightly and only in a spot or two, the floor should be washed carefully, rinsed and allowed to dry. (Before beginning to apply the paint stir it until there is none left around the edges of the can and until it runs from the stirrer like milk.) "Touch up" the worn spots

with paint just as near the color of the rest of the floor as possible and allow to dry. Then sandpaper the joining edges smooth, dust clean, and give the whole floor a coat of paint a shade darker than the original coat. Follow with a second coat if the floor is to have hard usage.

REVARNISHING

The same question arises regarding a floor with old varnish on it as one with old paint. If it is too much cracked, scratched, and worn to "touch up," proceed with its treatment for renewal in the same way as directed in the preceding paragraph for old paint. If it is not scratched but is worn off in a spot by a door, wash the floor carefully, allow it to dry thoroughly and varnish this worn spot. When dry smooth the edges with fine sandpaper (0 or 00) and go over the whole floor with a new coat of varnish to which has been added enough coloring matter to make a darker varnish than the original coat. Keep in mind that neither paint nor varnish will give satisfactory results unless all grease spots are removed before the coat is applied. Much more satisfactory results will be obtained if the varnish is warmed before using, for it flows more evenly and without leaving a dark line where a joining is made. To heat the can of varnish remove the cap and set the can in a pan of hot water.

REWAXING

If a waxed floor is preferred, but the one now in use has become dark and dingy looking, it may be renewed by going over the surface with a clean, soft cloth moistened with turpentine or kerosene. This will remove the surface of wax in which the dust and dirt have become imbedded, and when this is removed it is necessary only to go over the floor with a clean, dry mop and then rewax. Keep in mind that it is "a little wax and much rubbing" that is required to give a beautiful soft luster to the floor. Ordinarily the upkeep of a waxed floor requires very little work if the above rule is kept in mind. Too many people complain of the work entailed because they transpose the rule, that is they use much wax and little rubbing. One point in favor of the waxed floor is that worn spots can be rewaxed without the necessity of going over the whole floor, and the floor can be used immediately afterwards. A weighted polisher is the best piece of equipment to use for waxing a floor. This can now be found at any large hardware store and at many department stores.[1]

[1] Electric polishers which are very easy to operate are on the market and also may be rented by the day.

REOILING

Much has been written for and against the oiled floor and everything said has been true in some cases. Where the oiled floor has become a dingy, gummy, dust and dirt collector, it has been due to one of two reasons, or to a combination of the two: Either an oil entirely unsuited for use on the floor of a house or office was used, or it was not correctly treated when applied.

There is no more attractive, or inexpensive, floor finish for bedrooms in some of the big, old country homes, survivors from times gone by, than that obtained by an application of hot "boiled" linseed oil. Provided (and here is where so many people make their mistake) the oil application is allowed to remain on the wood from one-half to one hour and then all excess oil is rubbed off with a clean, dry mop. Many people forget that wood can absorb only a certain amount of oil and that the remainder, not being able to get into the wood, will remain on the surface and of necessity become a collector of all dust particles in the room. Therefore, a floor that has been well and correctly oiled will not need another application for several months.

A floor that has been oiled, can later be waxed, shellacked, or varnished if desired. The two things to remember are: That oil must have dried into the wood thoroughly; and the floor must be well washed with warm water and mild soap, rinsed, and dried before varnishing or waxing. . . . .

COVERING FLOORS

Where the floor is old and badly worn, many housewives have thought to free themselves from a great deal of labor by covering that worn, uneven surface. Because of a lack of information they lay the material selected directly over the uneven floor. As a result many complaints are made regarding the different materials sold. This is due, in some cases, to the fact that the housewife takes it for granted that all she has to do is to lay this attractive-looking new surface over the splintered, cracked and worn old boards, and for years enjoy her pretty floor covering and her relief from laborious cleaning. In other cases the salesman does not understand the care that should be given to the floor. This information, therefore, is included here in order that the woman may know what should be done before an expensive covering is laid over her wooden floor.

PREPARATION OF THE OLD FLOOR FOR LINOLEUM

The floor surface must be clean and even. (Plane if necessary.)
All cracks must be filled. (Use "crack and crevice" filler.)

The floor must be dry. If there is any danger of dampness with resulting expansion and contraction, heavy felt paper should be used. The use of this increases the life of the linoleum and also makes the floor warmer and easier for the person who is to walk on it.

The quarter-round floor molding should be removed.

Felt paper, after being cut to fit the floor the short way of the room, is fastened in place on the floor by using moisture-proof cement. This should be brushed on the paper as it unrolls and is pressed down carefully on the floor, leaving no creases in the felt.

If it is known that the floor is absolutely dry two thicknesses of builder's paper may be used instead of felt. It will cost less, but will act just as well as the felt for a cushion between the floor and linoleum.

FURNITURE REFINISHING[1]

By MARION L. TUCKER

. . . . If the article has the three essentials of good furniture, which are good lines, good wood and good construction, refinishing is likely to be profitable. But if it lacks these essentials it is usually not worth refinishing. Satisfactory results always demand time, patience and much "elbow grease" or rubbing.

The following directions may be used in obtaining a new finish on any piece of furniture.

PROCESSES

1. *Have any necessary repair work done.*

2. *Remove all unnecessary ornaments.*—Meaningless, machine-made carving is often found glued onto furniture, especially golden oak. This can be easily removed by the use of a chisel and the result is usually a decided improvement.

3. *Remove varnish or paint.*—

(1) Scrape off, using knife blade, piece of glass, steel, or sandpaper. This method can be used on smooth surfaces, and if the varnish is old and dry, the work of removal will progress rapidly. On rough surfaces, in cracks and crevices, great care must be taken not to mar the wood. This is too harsh a treatment for veneered or any delicate surfaces.

(2) Soften varnish or paint. There are several materials, such as ammonia, turpentine and alcohol, which will dissolve varnish, but the

[1] Adapted from *Refinishing and Care of Furniture.* Iowa State College of Agriculture, 1925.

most satisfactory method is by the use of a commercial varnish remover. There are many varnish removers on the market, all about equally good. They soften the varnish, which can be easily scraped off when in a sticky, gummy condition. A putty knife is good for this work on flat surfaces. A paste made of strong washing powder and hot water, allowed to stand on the varnish, then scrubbed with a stiff brush, will remove the varnish. . . . . For a satisfactory final result every particle of the original finish must be removed. Frequently a combination of dry scraping and the softening gives best results. A thorough wiping with gasoline, turpentine or benzine is necessary to remove all the grease of the varnish remover.

4. *Remove stains.*—Use oxalic acid—one teaspoonful to one pint of water. If persistently applied, it will remove ink stains. It sometimes bleaches the wood too much. The color may be brought back by the use of weak ammonia. If stains refuse to respond to this treatment, they may be removed during the next process.

5. *Smooth surface.*—(Wood must be thoroughly dry before smoothing is done.)

Sandpaper: Use over block of wood on all flat surfaces, for this gives even pressure. There are several grades of sandpaper. Use medium or fine, according to needs of piece. Use great care when sandpapering veneered surfaces.

Steel wool: No. 1, fine; No. 2, coarse. Handle with gloves so filings will not get in hands.

Steel scraper: A small piece of steel, the edge of which must be frequently sharpened by filing in order to make it do satisfactory work. Never use on veneered surfaces.

Any one or all three of these may be used. Always work with the grain of the wood and aim for an absolutely smooth, satiny surface. If medium sandpaper or steel wool is used, follow up with finer grade.

6. *Stain.*—Omit this if the natural color is desired. Many good wood stains are on the market. Select the color desired, but always try it out first on an inconspicuous part of the furniture. If any part of the piece of furniture has been removed when getting it ready to refinish, this piece of wood can be used for trying out stains. Put stain on with a brush or cloth. Rub off with cheese cloth. Every particle of the stain must be either rubbed off or rubbed in. The rubbing should be continued until there is some luster. Several coats of stain may be required to get desired color. Allow each coat to dry thoroughly before applying the next one. It is

better to have the first coat as dark as desirable and not be compelled to repeat.

7. *Filler.*—Unless the previous work has been very harsh, this step may be omitted. When furniture is made, a filler, either liquid or paste, is applied after the stain. This fills all the pores of the wood and makes a smooth surface for the finish. If this filler has been worked out of the wood in the preceding processes, it will be necessary at this point to renew it. Get a liquid filler for a close-grained wood and a paste filler for an open-grained wood. The filler usually matches the stain in color and is therefore inconspicuous.

8. *Surface finish.*—There are several kinds of finishes. The use of the furniture, the kind of wood, and the personal liking of the owner, will doubtless influence the choice. There are advantages and disadvantages in any finish. Wax is easily applied, gives a soft, pleasing luster and can be readily patched if scratched or marred. It has to be renewed frequently.

Varnish, when scratched, cannot be patched. The whole surface must be done over. It is glossy and shiny unless well rubbed down, which requires expertness and is most unattractive unless done well. A piece of furniture with shiny varnish finish may have this gloss dulled if rubbed down according to directions given later. A cheap varnish will not stand this treatment.

Wax: *a*) Wax may be applied directly after the stain. This is the easiest and quickest finish and is satisfactory if frequently renewed. Use any good floor wax. Apply a rather thick coat, rub it well into the pores of the wood, allow to stand five to ten minutes, then polish. Use circular motion, then rub with the grain of the wood. Polish wood, but do not scrub it. This may be repeated a second time to get a good luster.

b) A coat of shellac may be given first. Rub this down with fine sandpaper and then apply the wax. This will wear longer than wax alone, but the finish is much shinier and glossier.

(A and B are good finishes for oak.)

c) (This is recommended especially for old walnut furniture.) Apply a thin coat of raw linseed oil to the furniture, rubbing long and vigorously in order that no oil may be left standing on the surface. If the wood is very old and dry, it is a good plan to let the oil stand on the wood several hours before rubbing. After the oil is rubbed in, apply a wax finish.

Varnish: Apply one or two coats of shellac, rub each down with fine sandpaper until perfectly smooth, then apply a coat of varnish. After the

varnish is thoroughly dry, if a "rubbed finish" is desired, dip a damp cloth in powdered pumice stone and rub with what adheres. Work with the grain of the wood. This dulls the gloss but does not break the surface. Two or more coats of varnish are usually given, each one rubbed down. Rub the last coat with pumice and raw linseed oil, then rub with oil alone. This is called egg-shell or "rubbed" finish, and is much more difficult for an amateur than the wax finish.

Oil: This is not a common finish and is seldom used except for old mahogany or walnut. Raw linseed oil may be used. Apply not one coat of oil, but many, rubbing until all the oil is rubbed in or rubbed off. Twenty-four hours should elapse between applications of oil. If such a finish is given thoroughly the result is an excellent one, for it brings out the natural beauty of the wood and gives it a beautiful, soft sheen.

PAINTED FURNITURE

. . . . To make a perfect job of an old varnished piece, every bit of varnish should be removed, according to directions given previously. Unless this is done the work will not be entirely satisfactory. However, it takes time to remove varnish and it may be that for the particular purpose for which the piece is to be used, it is not advisable to expend that much time. Painting may be done over the varnish, but it is never quite so sure to stick. Be sure the varnish is absolutely clean, for paint will not stick to a greasy surface. Rub with fine sandpaper or steel wool. This smooths any roughness there may be and removes any loose particles of varnish ready to cake off. It also breaks the smooth, hard surface of the varnish, and gives the paint a chance to work through and get a hold on the wood underneath.

Whether the wood is clean or whether the varnish is left on, use the flat no-gloss house paint for the first coat. If there is a dark surface to be covered by a light paint, two coats of flat paint will probably be needed. When the flat paint is thoroughly dry, add a coat of enamel paint of the color desired. Work rapidly, using as few brush strokes as possible. One secret of success in painting is in the thorough mixing and stirring of the paint. Stir until every bit of sediment has been removed and the oil is thoroughly mixed. If the sediment persists, strain the paint. In order to keep the paint in the best condition, pour out a little into a dish for use. When more is needed, stir thoroughly before removing from the can. This leaves the paint in the can fresh and clean.

UPHOLSTERING OLD CHAIRS AND COUCHES[1]

By DAISY DEANE WILLIAMSON

The purpose of this [article] is to show, step by step, how to re-upholster chairs and couches. The tools listed are the minimum equipment.

TOOLS NEEDED

A pair of shears, gimp hammer (i.e., a small hammer and tack puller combined), webbing stretcher, a long darning needle and a curved upholstery needle.

The stretcher may be made by driving nails into a piece of wood, filing off the heads, and sharpening each end. If no stretcher is available, use this simple device: Take a board about $\frac{1}{2}\times 4\times 10$ inches. Wrap the loose end of the webbing around the narrow way of the board so that the board is to the underside. Use this as a lever, bracing the board against the frame to stretch the webbing tight.

PREPARATION FOR RE-UPHOLSTERING A CHAIR

Remove the gimp, outer and inner covering, and padding, being careful not to mar the wood. If the springs and webbing are in good condition and in position, they need not be removed. If not, dismantle the chair down to the frame. Pull out all tacks left around the seat, and glue any loose joints. If the chair needs refinishing, this should be done before the work of rebuilding is commenced.

PLACING THE WEBBING

Use three and one-half inch webbing. The average sized chair seat has two rows of webbing running from side to side, and two or three rows from front to back.

Turn the chair upside down and work on the underside. Locate the strips of webbing to give ample support to the springs. If three strips are to be used from front to back, place the center one first.

Use the uncut roll of webbing. Fold the loose end over about one inch and tack with four or five 10 oz. tacks near the middle of the rail. Use the webbing stretcher to pull the webbing across tightly, and fasten with two or three tacks. Cut the webbing one inch longer, fold it back over the tacked portion, and fasten it down with two more.

Proceed in like manner with all the strips, interlacing.

[1] From *Upholstering Old Chairs and Couches.* University of New Hampshire Extension Service, 1928.

SETTING AND TYING THE SPRINGS

Use four, five or six springs according to the size of the seat. If the old ones are in good condition, they may be used. Arrange on lapped parts of the webbing with bent ends of springs up in such a manner as to give good support and good shape. A two and a half or a three-inch space is left between the outer edge of the springs and the rail.

With stitching twine sew the lower round of the springs to the webbing in three or four places, making a close loop over the bottom coil on top of the webbing and a long stitch from one point of fastening to the other on the underside. Make the end secure. A darning needle can be used quite satisfactorily for this sewing.

For tying use spring twine, jute No. 60. The cords should be about one and three-fourths times the width across the seat.

Wrap the end of the twine around a 10 oz. tack, and drive the tack into the top edge of the frame in a line with the center of the spring. Push the spring down firmly so the outer edge is about one inch lower than the inner edge. Hold the twine and spring in position with the left hand. With the right hand pass the free end of the twine down inside the coil, up on the left side of the fastened end, down inside the coil again, up on the right side of the fastened end, and through the loop formed. Pull the twine tight. This makes the clove-hitch knot which holds the spring securely even if the twine across the open end of the spring wears through.

Stretch the twine across the top of the spring to the opposite side. The knot is the same as used before, but in making it the twine goes over the outside of the top coil first and then up on the inside. This procedure places the knots in a position to stand the wear best.

See that the second spring stands equi-distant from the first at the top and bottom. Proceed as with the first spring. To fasten the end of the twine drive a tack partly into the rail opposite the first one, wrap the twine once and a half around it, pull the spring into position, tighten the twine, and drive the tack in securely. Be careful not to drive it down so tightly as to cut the cord. A second tack close to the other across the twine will make the fastening more secure.

The springs must be tied to the frame with one twine from front to back, one from side to side, and two diagonals. The last twine should be tied to all others crossing in the center of the top of the springs. This prevents wear from rubbing. When the tying is complete the seat should give a slightly rounded effect with the bodies of the springs standing erect.

COVERING THE SPRINGS

Tack a piece of medium-weight burlap, old or new, on the top edge of the frame with four-oz. tacks, the edges being turned over as the tacking is done. Be careful not to pull it tight enough to lower the springs. This layer of burlap gives smoothness to the seat and protection to the twine. Sew it to the springs, using a curved upholsterer's needle or ordinary darning needle.

PADDING THE SEAT

Place in position the old padding if in good condition. Excelsior, horse hair, or moss will be satisfactory if new material must be secured. The padding should be worked down and out over the edge of the seat. The layer should be thick enough so that the springs will not be felt through it and so that it will be comfortable. Sew it in places to the burlap layer and to the springs.

Over the padding put a layer of cotton batting, tucking the ends under the outer edges of the padding. Tack tightly over this a layer of unbleached muslin. Fasten in the center front and center back, then in the center on each side, and work toward the corners. The tacks should be placed high enough to be concealed by the outer covering and gimp. Special care should be taken in finishing the corners. It may be necessary to cut the muslin diagonally from the corner to a point near the leg in order to fit it smoothly.

PUTTING ON THE OUTER COVERING

Use the old covering for a pattern to cut the new one. Tapestry, chintz, denim, and mohair are materials commonly used. Use the same procedure in putting on this layer as in putting on the muslin. This covering should be tight and smooth. It should hide the edges of the muslin, but not extend too low to be covered by the gimp.

THE FINISHING TOUCHES

The gimp gives a finishing touch to the chair. It should conceal the edges of the outer covering. The tacks (No. four gimp tacks) should be placed about two inches apart along the center of the gimp. The piecing should come at one of the back legs, if possible, where it will be scarcely noticed.

A piece of cambric is tacked to the frame over the webbing on the underside. This gives a neat finish and prevents any siftings from the padding dropping to the floor.

BOX SEAT AND BACK

Some chairs have removable backs and seats which are fastened to the frame work with screws. The springs are set in a box, so no webbing is needed.

The method for re-upholstering such chairs is the same as previously described from the tying of the springs through the placing of the outer covering. The back and seat are put in the frame, and then the gimp is put on, if needed.

The outside of the back should be covered with the upholstery material, and the underside of the seat should be covered with cambric.

A COUCH RESTORED TO USEFULNESS

Re-upholstering a couch is a longer process, but the method is the same as that used in restoring the chair. Some couches have the springs set in a box, while others have them supported by webbing.

SUMMARY

Best results are obtained in refinishing walls if all old finish is removed, particularly if such finish is loose or shows signs of peeling. The most common wall finishes are the various kinds of paints (including alabastine) wallpaper and wall coverings. The most used finishes for woodwork are stains, varnishes, enamels and paints, and wax. The most used floor finishes are wax, paints, varnishes, and oils. For badly worn and splintered floors, floor coverings are often advisable. The refinishing of furniture is profitable if the article to be refinished has good lines, good wood, and good construction. There are several kinds of furniture finishes; the kind of wood, the use of the piece, and personal preference usually dictate the kind to be selected.

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[NOTE.—Many of the State Colleges of Agriculture distribute excellent bulletins on wall and floor finishes and furniture reconditioning.]

CHAPTER XV

HOUSING STANDARDS

SOME OF THE ELEMENTS OF GOOD HOUSING[1]

By JOHN M. GRIES
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Housing standards relate mainly to adequacy of shelter from the elements, light, ventilation, water supply, disposal of waste, privacy, space for play and family gatherings, arrangement and equipment affecting the amount of labor required for housework, appearance and general attractiveness, housekeeping, maintenance, and constant improvement as the family's needs develop and its taste improves. The last statement is not meant as an argument for continual discontent with the best that may be available at any given time, or that a house should undergo extensive alterations once or twice a year. It does mean, however, that a family which resigns itself to accept, as a matter of course, temporary "make-shifts" which it could be reasonably expected to remedy, loses in self-respect, and suffers accordingly. It means that every family can make its home more attractive and livable by constant attention to matters of detail. It means that every time a room is re-papered, or any time the interior decoration is changed the result should be a distinct advance over the old.

Standards vary according to whether the house is on a farm, or in a small town or a suburb or a large city, but many of the principles apply to all classes of houses, and examples chosen from one group may have their counterpart in another.

. . . . Every child needs plenty of sunlight and fresh air, and is better off in a well-kept house with modern improvements, in which there is enough room for privacy and for the different members of the family to be alone when they wish.

[1] Adapted from "Housing Standards," *Child Welfare Magazine*, May, 1925.

On the other hand, poor sanitation may mean illness and death. Falling plaster, unpainted and never-cleaned woodwork, a general state of disrepair, filth and litter in and about the house, and similar deficiencies, have a depressing effect on an adult or child.

PHYSICAL STRUCTURE

The first element in good housing is the physical structure of the dwelling and its state of repair. Foundations underlie the house. If they are not adequate they will settle unevenly and throw the whole structure and frame of the house out of alignment, resulting in cracked plaster, doors that will not shut, and bulging and sagging floors. The cellar should be dry. The walls and framing of the house need to be well designed, and substantial, if it is to stand square and true through wind and storm, and not shrink out of line as the timber seasons. These and other standards, and the means for realizing them in new construction, are set forth at some length in the Department of Commerce booklet on small dwelling construction.[1]

The outside walls should be well insulated against cold and heat, and in northern climates window openings should be weatherproof. A good roof is absolutely requisite, for water leaking through stains the wall surfaces and leads to rot and decay. The floors need to be firm, and the plastering, if any, must be on a firm backing and of good workmanship in order that cracks may be as few as possible, and so that it will not drop off.

NUMBER AND ARRANGEMENT OF ROOMS

It is not so much the cubic feet of space in a house as the way in which that space is used, which is important in a house of average size. Hence it is difficult to say what should be the minimum space required for a family of a given size. The extremely high ceilings of a few decades ago provided a lot of space which served no practical purpose. Modern housekeeping demands compact rooms, planned to make housework easier.

In most cities combating dust and soot is no small part of the housework, and other things being equal, the smaller the surfaces to be cleaned, and the easier the particular type of surface can be cleaned, the better. Plenty of closet space in all parts of the house is a great saver of work in housekeeping, and deserves important consideration in selecting a house plan or in purchasing a house.

[1] *Recommended Minimum Requirements for Small Dwelling Construction*, by the Building Code Committee, Department of Commerce.

Families that are rearing children ordinarily require three sleeping rooms. It is, of course, preferable if each child can have his own room. Though it be small, it is a place for the order of which he is definitely responsible, and in which he can study and play and read undisturbed. Where there are small children, many parents prefer to have the bathroom and one bedroom downstairs.

Every family wants to have an attractive living room in which the members of the family may gather and receive their friends. The need for a dining room is not so essential. Individual preferences and needs undoubtedly vary, ...

The kitchen should be very carefully arranged to make the preparation of meals and cleaning up afterward as easy as possible. . . . .

LIGHT, VENTILATION, AND HEAT

"The more sunlight, the better" is a good rule for a house. In apartments there is usually not the same opportunity to have sunlight in every room as in a small detached house, but there ought to be at least one room which has plenty of it. . . . . Many small houses are built nowadays with an enclosed sun porch, which is a valuable addition when it can be afforded. During the infant stage the child's needs for plenty of fresh air may be met by a porch where the baby may sleep or play during the day with his mother close at hand.

Good ventilation in a small house is not hard to obtain during cold weather when all that is needed in a single room is to open the window a few inches. The difference of temperature between the inside and outside air insures plenty of circulation. In hot weather, however, it is desirable to have room so arranged that the prevailing wind can blow through from one side to the other. This is not possible in many apartments, where electric fans are often used as a substitute. In many small houses, unfortunately, the interior arrangement is such that good ventilation during the summer is difficult. The kitchen, particularly, should have good cross ventilation and receive plenty of air from the prevailing wind.

A good heating system is one able to maintain the house at a comfortable temperature and proper humidity during the ordinary winter weather, and it does not often need supplementing by open fires (however desirable for making a room cheerful), or by portable heaters, although an exception may be made of the use of the latter in the bathroom during the early morning or when children are being bathed. It should be remembered that the expense of heating a house depends not only on the

efficiency of the furnace or stoves, but on the weatherproofness of the house.

PLUMBING

A good system of plumbing with a supply of pure water has been said to be the most important single contribution of modern civilization to comfort, health, and elimination of disagreeable housework. Those who have been accustomed to its advantages can have but little realization of the toil that is required to pump and carry water from a well or spring, and of the difficulty and unpleasantness of disposing, in one way or another, of the wastes which plumbing fixtures and house drainage systems carry away so easily. A committee of sanitary engineers and plumbing experts, associated with the Department of Commerce, has formulated a set of basic plumbing principles which have been widely accepted by sanitary engineers.

Anyone who has had experience with leaking, stopped-up, or overflowing drainage systems, needs no warning that good standards should be rigorously carried out.[1]

INTERIOR DECORATION

The interior decoration of the home has an undeniable effect on the general atmosphere and happiness of home life. A family may have to live for a time in a house where the walls and floors have to be covered with newspapers to keep out the cold, and for a time a family may "camp out" under almost any conditions without being the worse for it. But a family which resigns itself to makeshifts, which it has the power to replace with something adequate, as a part of its permanent living conditions, cannot have a successful home life.

It is impossible to define what standards should be set for a house that is attractive, but it may safely be said that it should be neat, should not reveal obviously unfinished parts, and should look well both in detail and as a whole.

THE EXTERIOR OF THE HOUSE, AND ITS SURROUNDINGS

It might be difficult to convince some people that bad architecture is a significant violation of housing standards. There are

[1] Those interested in the design of house plumbing systems are referred to *Recommended Minimum Requirements for Plumbing*, by the Subcommittee on Plumbing of the United States Department of Commerce. This pamphlet may be obtained from the Department or from the Superintendent of Documents, Government Printing Office, Washington, D.C.

few, however, who would deny that, other things being equal, a house is better when it is pleasing to look at from the outside, and that whatever the architecture, it should be maintained in a state of good repair. The exterior of the house is seen by all the neighbors and by every visitor to it, and when a family gets to the point where it does not care whether anyone sees that its shutters are falling off, or that its porch has sagged, or that the rain leaders from the gutters have rusted out, and the side of the house is being stained, it has lost the honest pride which it ought to have retained. How many a farmhouse looks like a hovel because a flock of chickens has free run around it, killing the grass and leaving filth and feathers! How many a family, on the other hand, stands out in a community because it has the best kept lawn and the best garden, or because it keeps a little plot of grass and a few shrubs where its neighbors do not?

HOME OWNERSHIP

An owned house ordinarily is to be preferred to a rented one. The family has the maintenance of the house directly within its control, and feels free to go ahead with permanent improvements. It knows that it is not going to be evicted, and that the better condition a house is in, the better price it will bring if it comes to be sold.

Buying a home and reducing the debt on it is an incentive to thrift. A family with a substantial equity in a home is on its ways toward financial independence, and has a justifiable pride, and a more assured standing in the community. But a home with too great a value in relation to the family's income is a poor one to buy, for the attempt to pay for it may involve an exhausting and depressing struggle, and end in failure.

APARTMENTS

Most of the desirable and undesirable elements for one-family houses that have been mentioned apply also to apartments. Maintenance of the structure is not within the direct control of the tenant. A family in an apartment house usually suffers disadvantages in the loss of privacy, inaccessibility to outdoor play space for children (although play space may be near by, it is not so convenient as a back yard), and must crowd itself into smaller quarters. The cash outlay for services is greater, and children miss much invaluable training through not having space for work benches, and not having instructive tasks about the house to perform.

Although there are many apartments which conform to good standards of light and ventilation there are many which do not. It is, in fact, the

lack of light and air inherent in large closely-built habitations that makes them so often unfit to live in. Rooms opening on small courts or shafts are often but little better than the old unventilated inside rooms which have been so universally condemned.

CONCLUSION

The majority of American houses meet reasonable standards of shelter from the elements, privacy, space, light, ventilation, and heating. There are still millions of them, however, which do not have plumbing or good artificial or natural light, which are overcrowded, and which expose their occupants cruelly to extremes of cold or heat. The houses included for one or more reasons in the deficient group stand as a challenge, not only to the families living in them, but to the communities in which they are situated, and to the entire nation.

In a still larger group of homes, health and character suffer to a certain extent, and home life fails to reach its finest fruition because the families in them do not make the best of what they have. "Plain living and high thinking" is an excellent motto, but its author does not forget that maintaining a good standard of plain living is a task that calls for a goodly share of our best brains and energy.

HOUSING STANDARDS WITH PARTICULAR REFERENCE TO THE HEALTH, SAFETY AND WELFARE OF CHILDREN[1]

By JAMES FORD

Chairman of the Subcommittee on Housing and Executive Director of Better Homes in America

Standards give something to work toward. It is possible to incorporate most of these standards in new dwellings for any income group, though it is recognized that certain of those relating to equipment and fireproofing and to the provision of a play room or nursery would seem to be out of the question to many contractors, realtors and home builders. Good management in the home can also largely overcome defects in equipment or prevent injury arising therefrom. Old homes, defective in many particulars, can, step by step, be brought up to standard, beginning with those

[1] Adapted from *Housing Standards with Particular Reference to the Health, Safety and Welfare of Children* (report of the Subcommittee of the White House Conference on Child Health and Protection, Washington, D.C., November, 1930). Published in *The American Building Association News*, February, 1931. The standards which follow are optimum standards drawn up for dwellings in which there are children. They are desirable standards toward which the great majority of families may look forward.

matters which seem most urgent and bearing in mind always the more fundamental needs of the child.

Even in those cases where the standards seem impractical because of their cost, they may, when judiciously applied, result in enhancing the sales value of the property and in reducing maintenance costs.

In cities, building codes and zoning laws already lead to the incorporation of many of these standards in all new construction, and improvements in such laws raise the requirements from time to time. In general, however, such legislation provides only for such protection of health and safety as may seem practical and expedient at the time the law is framed. Progressive improvement of such laws helps to make these standards increasingly available even for those citizens who are unaware of them and of their importance. To an increasing extent, through city planning and zoning, the amenities of life are becoming available to our city and suburban population. It is impossible, however, through law to provide universally all of the conditions that are essential to wholesome living. It is hoped through consideration of the suggestions which follow (which are based on studies made by leading specialists in the field of housing and home economics) that housing will be considered increasingly with reference to its effect upon the health, protection and welfare of children. No other aspect of the subject is as important as this, for it is the prerogative of parents to make any necessary and reasonable sacrifices which will give their children a better start in life and a better chance than they themselves had to grow to their full mental, moral and physical stature.

In substance, therefore, we may say that these standards appear to the Committee to represent desirable and reasonable objectives which may wisely be considered by all groups interested in housing and child welfare and toward which they may direct their efforts. They may also serve as a check list of the housing needs of children which parents may wisely take into consideration with reference to their applicability to their own domestic needs in buying or building a home.

HOUSING STANDARDS

A. Neighborhood

1. The neighborhood should be primarily residential. Homes should not be located within an industrial district.
2. It should be protected by zoning laws, where necessary supplemented by deed restrictions.

   It is perhaps the usual rule that zoning regulations should be supplemented by deed restrictions. Carefully drawn deed restrictions should

apply to all lots in residential districts, whether sold or unsold. They should not be about to expire and they should be drawn in such a way as to permit of modification under proper safeguards every twenty to thirty years.

3. The preferable location for a home is on a minor street so planned as not to be inviting to through traffic.

   In cases where apartment houses or single-family houses are located on major streets provision should be made for adequate set-backs, for the planting of roadside trees and grass borders and for protection from traffic dangers.

   In new subdivisions it is better to have streets run northeast by southwest, and northwest by southeast, so that the possibility of having rooms with due north exposure may be obviated.

4. Residences should be located within relatively easy access of churches, schools, civic, cultural and shopping centers.

   Reasonable proximity to places of employment for each of the working members of the household should also be taken into consideration, so that a minimum of time will be lost in transit between work and home and a maximum amount of time available for family life and for common activities of parents and children.

5. Neighborhood stores should be so located as not to be detrimental to the residential character of the neighborhood and should be so designed and treated with reference to set-backs and planting as to enhance the attractiveness of the district they serve.

6. Neighborhoods should so far as possible have charm and distinctiveness and be free from ugliness and monotony and conditions which tend to depress or humiliate the family. Street trees and grass strips should be provided on all residential streets and there should be frequent small parks within the district.

   In neighborhoods where there are row houses or detached houses built from identical plans, individuality can be secured through planting and through the use of window boxes, porch and garden furniture, etc.

7. Children should not have to depend upon the street for their play. Play space should be provided either in individual yards, or in yards thrown together, or in accessible and safely approached neighborhood playgrounds under conditions of adequate supervision and with adequate play equipment. Careful attention should be paid to the landscaping of the playgrounds, so as to provide shade trees at locations which will not interfere with play activities, and shrubs, hedges or grass borders so that the playground may not detract from the appearance of its neighborhood.

8. Residences should not be unduly near railroads, aviation landing fields, public garages, stables, dumps, marshes or obnoxious industries.

9. The neighborhood should be free from smoke, dust, odors, fumes, noise and heavy traffic.
10. Residences should not be located on land that is frequently flooded or so low that it is damp or subject to difficulties in sewage disposal. Areas of low-lying land improperly or insufficiently drained and areas of made land where decayable matter has been used to make the fill should be avoided as residence sites.
11. The neighborhood should be free from "moral nuisances" such as disorderly houses, centers of liquor traffic, and gambling houses.
12. Alleys are objectionable in residential districts and should not be planned in new subdivisions. Existing houses fronting on alleys should be abandoned under a comprehensive plan.
13. Steep grades should be avoided in streets.

B. Lot

1. House lots should be wide enough so that each room shall have sufficient light from open spaces on its own lot without depending upon its neighbors.

   The problem here is to provide adequate light and sunshine for the middle rooms of houses which are more than two rooms deep. Front and back rooms can secure their light from street and yard, but the middle rooms are dependent upon light which comes over the roofs of neighboring dwellings and hence require wider side yards.
2. Suitable play space should be provided in the yards to supplement neighborhood resources and should be so located that the play activities of small children can be easily observed by the mother while engaged in her daily routine.
3. If outdoor space for drying clothes is provided it should be properly screened so as not to render the neighborhood unattractive.

   Vine-covered lattices and hedges usually make the most satisfactory screens.
4. The lot should be properly graded or drained so that there will be no standing water.
5. Trees, shrubs and vines should be planted as they provide an attractive setting and furnish shade and privacy.
6. Private garages and any outbuildings should be easy of access, fire safe and so placed as not to interfere with the lighting of neighboring residences or with their attractiveness of outlook.
7. Proper provision should be made for the storing and disposal of garbage, rubbish, ashes and other household refuse. These should be kept in covered containers of ample capacity which will be fireproof, waterproof, rustproof and so placed and maintained that they will not interfere with the healthfulness, appearance or attractiveness of the premises.

C. House exterior

1. The house should be so designed and placed upon the lot as to provide for adequate sunning and natural lighting of all rooms. There should be direct sunshine at some time of day in each room throughout the year. No room should have only a north exposure.

   Sunshine is recognized as one of the most important means to vigorous health in childhood, and as circumstances often make it necessary to keep children indoors at various ages the adequate sunning of rooms is one of the most important means to child health. In planning new houses it is impossible to place them at an angle to the points of the compass so that there will be no north rooms, but if the street layout of the city is such as to make north rooms inevitable the planning should provide for additional windows to either the east or west. The north rooms would therefore be corner rooms.

2. Covered porches should not be so placed as to reduce unduly the natural lighting of rooms. No room should receive its sole natural light from windows opening upon covered or glassed-in porches.
3. Ugliness, excessive ornamentation and unpleasant color combinations should be avoided in the exterior of the home. The best effects are ordinarily secured through simplicity in the architecture.
4. All materials in house construction should be sound and durable. Houses should be well built in every respect.
5. Houses to be safe should be fire resistive.

   There is considerable loss of life annually of children in America because of the prevailing practice of building houses that are not fire resistive. To families or communities that consider it impossible to reach ideal standards of construction immediately, it might be stated that the minimum of protection for houses includes fire-resistive roof coverings and exterior walls, adequate fire-stopping between studs to prevent passage of fire through walls and floors, protection around sills and pipe openings and the use of fire-resistive materials to protect adequately all portions of the house where lighting or heating equipment may cause danger or through which fire might spread. Chimneys should be well built and properly flue-lined.

6. Foundations should be damp-proof, sound and durable. Houses should be securely anchored to their foundations and the roofs should be securely anchored to the house.
7. Buildings should be properly insulated against dampness, heat, cold and sound.
8. Houses should be kept in good repair in all their parts.

   Construction and maintenance should be such as to prevent dilapidation and disrepair, such as loose railings, rotten boarding, etc. Special

attention should be paid to the use of materials and methods of construction which experience has demonstrated to be safe or to new materials and methods of construction which give reasonable promise of being satisfactory. Construction and maintenance should keep roofs and walls free from leaks, and rain gutters and leaders should be so placed as to prevent accumulations of rain water and should be made free from clogging and leaking. There should be insulation against dampness and ventilated air space under the roof to protect from extreme heat or cold. Depending upon climatic conditions the house should be properly insulated against heat and cold.

D. House interior—general

1. The room arrangement in the house plan should be such as to make it possible to avoid lost motion, to save unnecessary steps and facilitate housework. There should be relatively easy access from room to room but it should also be possible to close each room off from the others when desired.
2. Each room should have adequate natural ventilation. Cross or through ventilation should be had either by placing windows on two sides of each room or by having doors so placed in line with windows that there shall be a moving current of air.

   Good natural ventilation involves ample provision for the intake of outside air, for the removal of used air and for keeping air continuously in motion. This should be possible without sacrifice of privacy and the use of artificial systems of ventilation should not be necessary.
3. Where climatic conditions make it necessary, air (so far as it is reasonably possible) should be conditioned with regard to temperature and humidity.
4. Each room should have at least one window but preferably two or more opening directly on a permanent open space sufficient in size to admit adequate light and sunlight. The total window space should not be less than fifteen square feet in area. The tops of windows should be as near the ceiling as is consistent with good architectural design. Windows should be so constructed that they can be opened either throughout all of their area or at both top and bottom.

   Tentative standards of the International Congress on Illumination held at Lake Saranac in 1928 suggest that at least some of the sky should be visible from table height over a considerable part of the room's area and that sunlight should be able to penetrate through at least half of the depth of the room.

   In buildings in which walls are unusually thick and in regions in which the smoke nuisance is prevalent the size of windows should be increased beyond the standards given above.

5. The room should be so designed that there will be suitable space for the principal pieces of furniture and so that these will not be in the way of doors, windows or closets.

   Radiators would often best be recessed to save space and permit access to windows and should be screened so as to protect children.

   Fireplaces should be located with reference both to appearance and the grouping of furniture around them.

   Doors, windows and such immovable equipment as radiators should be so placed as to provide adequate wall space for furnishings appropriate to the room.

   Particular attention should be paid in the planning for provision of wall space in sleeping rooms adequate for the location of beds with reference to cross ventilation.

6. Rooms should be generous in size, not only sufficient to accommodate the furniture but large enough to give a sense of space. Rooms should be high, especially in hot climates, to insure coolness, adequate ventilation and the psychological benefit that comes from spacious quarters.

   A living room 12 feet by 15 feet—180 sq.ft. in area—is adequate for most purposes. Other rooms may be somewhat smaller if properly planned with refe. ence to light, air and space needs. In private dwellings rooms 8 feet six inches high are permissible, but in multiple dwellings nothing less than 9 feet should be permitted.

7. The down-stairs common rooms, including the living room and dining room and also the parlor and music room if provided, may often advantageously be designed to open into one another so as to facilitate the entertainment of guests, though it should also be possible to close off each room for privacy so that any member of the family may entertain personal guests separately.

8. The sleeping quarters should be sufficiently separated from the living quarters to insure privacy. At least one bathroom should be reached from a private hall. Privacy should be provided by having each bedroom reached without passing through any other bedroom. In two-story houses the provision of a washbowl and water-closet on the first floor is often desirable in addition to the bathroom on the sleeping floor.

9. The kitchen should be cheerful and attractive. It should be easy of access to the dining room and so located in relation to dining and living rooms that odors of the kitchen and noises will not penetrate to the rest of the house.

   The kitchen would preferably be compact and rectangular in shape. There are four major functions to be performed in the kitchen, namely, the preparation of food, cooking, serving and clearing away. In addition to this it is desirable to have a center for the planning of household

activities which will be equipped with desk and telephone and also a rest center.

The larger built-in equipment should be grouped according to its use and arranged along the walls in a nearly continuous working surface. Windows should be above working equipment and the equipment not used in the preparation and clearing away of meals, as well as doors and closets, should be grouped remote from the working centers.

Working equipment should be so placed as to obviate overreaching and unnecessary stooping. The height of working surfaces should be adjusted to the individual worker.

It is desirable that as much equipment as possible should be built in so as to prevent the collection of dirt and dust. It is often desirable to place the stove in an alcove with only the front accessible. Toe space under working surfaces makes for comfort and if cabinets are built to the ceiling there will be fewer spaces on which dust may collect. All surfaces should be smooth and easily cleaned with soap and water. There should be no unnecessary angles.

A hood over the stove to carry heat and fumes away is desirable. Gas stoves should be vented by a flue to the chimney or to the outer air.

The windows should be located for a pleasant view and for supervision of outdoor play space.

10. A nursery, if provided, should be light and cheerful. The walls should be of hard finish and walls and floors should be smooth and easily cleaned.

The following detailed suggestions have been drawn up for the committee by teachers in the nursery school maintained by Teachers College at Cornell University and are submitted as suggestions to families that are in a position to provide a special room for this use:

The floor area should be at least 84 square feet for each child. Artificial lighting should be high and indirect. If side lights are used they should be out of the child's reach and the light source should be shielded. Hardwood floors or floors overlaid with battleship linoleum or cork are recommended since most of the child's play is on the floor. The bed space for the children should be away from the area in which the toys are kept.

The nursery should be situated near a lavatory and near the mother's work center in order to save her time and steps and at the same time provide the child with necessary supervision. This room should be convertible to other uses when there is no longer need for it as a nursery.

11. In cold climates entrances should not be direct to living room and kitchens. In general direct entrance to the living room is not desirable.

12. Steep stairs should be avoided. Landings should be broad. Triangular turns on stairs are unsafe and undesirable. Handrails or balustrades within the reach of young children should be provided on all stairs,

including those leading to the cellar and attic. All stairs should be adequately lighted and where there are young children it is often advisable to place gates at the tops of stairs.

13. Closet space should be ample for the needs of each member of the family and should be so located as to serve its purpose most conveniently.

    The closet for outdoor wraps should be on the entrance floor convenient to the door and reached without passing through any of the rooms. There should be a separate closet for children's outdoor wraps or else special provision should be made for them in this closet through low hooks and rods and low shelves or other special equipment for overshoes.

    Clothes closets should be provided with rods and of sufficient depth to freely take clothes hangers with clothes upon them.

    Broom closets should be located in the back-hall entry or kitchen.

    Linen closets should be located in the back hallway of the sleeping quarters and close to the bathroom.

    All closets should have doors and there should be knobs on the inside so that they can be opened by children.

14. Storage space ample in amount, reasonably accessible and free from dampness and properly lighted by natural or artificial light, should be provided for household possessions. This includes space for the storage of vegetables and fruits, trunks and bags, coal, wood and other fuel and for children's outdoor play equipment and seasonal or temporarily discarded possessions.

15. Some place should be provided as a play room for children. In case the extra room cannot be afforded by the family this may be either a corner of a bedroom or nursery or enclosed porch or of some other room, or in the case of older children a portion of a well-lighted and well-ventilated shed or attic. As the play room is outgrown it can be converted to some other use appropriate to the needs of the family. Special provision should be made through low drawers and cupboards for children's playthings.

16. There should be adequate provision for privacy for each member of the family. Each child should have a place where he can be undisturbed and quiet and have opportunity for uninterrupted study of home lessons or for reading or play.

17. There should be a workshop, which can usually be located in a dry, sunny, well-ventilated basement, shed, garage or attic in which the men and boys of the house can putter.

18. Generally a sleeping room for each person is desirable. Sleeping arrangements should be made with due regard to uninterrupted sleep, health, reasonable privacy and the individuality of the child. It is undesirable to have two children occupy the same bed whatever their age

19. Paints and wall coverings should in both color and texture be cheerful, restful, attractive and not over-stimulating. Woodwork and walls should be easy to keep clean.
20. Floors should be strong, smooth, tight and level, comfortable to stand and walk on, durable and easily cared for. In color, design and finish they should harmonize with the rest of the room. They may be of wood, cement, tile, linoleum, cork or other composition, according to the purpose to be served. If of wood the boards should be well-matched hardwood, preferably quarter sawn. Tile should be laid on cement. Linoleum should be cemented to the floor over a layer of felt.
21. Repair of all surfaces, floors, stairs, ceilings, walls, should be adequate for safety.

E. Fundamental equipment

1. Water supply should be adequate in amount, clean and free from pollution. There should be conveniently located outlets in kitchen, bathroom and cellar and for outside use in watering lawns and gardens. In rural districts or those beyond the reach of municipal water supply the well or spring should be so situated and protected as to avoid contamination. The water should be piped into the house and, if necessary, provision should be made for adequate protected storage. An ample supply of hot water is essential.
2. Modern sanitary plumbing fixtures, noiseless, easily flushed, cleaned and vented, should be provided. All pipes should be of durable type with tight joints and traps readily accessible for cleaning or repairs. Water-closets may be located in compartments separate from the bathroom, well-lighted and ventilated to the outer air. Water-closet accommodations should never be located out-of-doors.
3. Heating appliances should be of such types and sizes as will heat all parts of the house adequately. As there is danger of overheating as well as of underheating it is often desirable to provide for thermostat control. Provision for humidification is also desirable.
4. Artificial lighting should avoid dangers from fire and should not cause eyestrain. Outlets should be sufficient in number and so located as to make it possible to engage in any kind of household activity such as cooking, serving of food, cleaning, play or studying under conditions that are convenient and comfortable. Too intense lighting should be avoided.
5. The refrigerator should be designed for thorough circulation of cold air. Proper insulation requires an efficient heat-retarding material of adequate thickness between inner and outer walls. This material should be compact, non-deteriorating, moisture- and germ-proof and odorless. All parts of the refrigerator should be easily cleaned. Proper drainage should

be provided with permanent sewer connection. The drain pipe should be easily accessible for cleaning. For mechanically-cooled refrigerators further requirements are: Quiet, dependable and economical automatic operation; minimum of service maintenance; freezing of water in a reasonable length of time; accessibility for repairs; freedom from wear of moving parts; safety of operation of exterior moving parts, of electrical apparatus or of burners. The refrigerator should be level and should be placed in as cool and protected a position as is compatible with convenient service.

6. Desirable built-in equipment includes also kitchen cupboards, preferably flanking the sink, built-in ironing boards, a passway between kitchen and dining room, china closets, bookshelves, window seats with storage space underneath, shelves and drawers in linen closets, low drawers, cupboards and hooks for children's toys or other possessions in the playrooms or the children's bedrooms. Each of these should be planned with a view to convenience in use.
7. All electric wiring and equipment, including the radio, should be installed according to standard safety practices and certified to by the properly constituted public authorities and by fire underwriters. The installation of electric apparatus near sinks, laundry tubs, bathtubs and lavatories where shock hazards from heedless use are greatest should be avoided. Non-absorptive insulating sockets for fixtures near such conveniences are a wise safety precaution. Fuses and switches should be enclosed and so located as to be inaccessible to children. An ample supply of base plugs and double convenience outlets are desirable and permit maximum service. Hall lights and lights for cellar stairs should be controlled by three-way switches at top and bottom of stairs.
8. Shut-off cocks for gas meters should be accessible and controlled by a locked box and manipulated only by representatives of gas companies. The installation of slot meters should be avoided. Open-flame gas jets are a fire hazard and should not be used. Gas or other open-flame lighting fixtures should not be located near windows or other places where draperies may be hung. Gas ranges or water heaters and gas logs should have direct connection with chimney flues. Hose connections for gas stoves, table lamps and other gas apparatus should be placed several inches away from control cocks for lighting fixtures. Gas ranges should have automatic lighters.

RECOMMENDED MINIMUM HOUSING STANDARDS[1]

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From information obtained by a study of the intimate family life in various industrial towns, after consideration of the many practical elements entering into the question, and taking into consideration the expressed opinion of many qualified authorities, the author's recommendations as to the minimum requirements of "An Industrial Worker's Home" are as follows:

1. *Materials.*—Permanent weatherproof construction of exterior walls and roof.
2. *Cellar.*—Cellar to be provided, except in localities where impractical or unnecessary.
3. In case cellar is omitted, first floor to be at least two ft. above ground and supported on masonry piers or foundations carried below frost line; and the clear space enclosed but adequately ventilated.
4. Where cellar is provided, it shall have cement floor and floor drain.
5. Cellar to be properly lighted and ventilated.
6. No living quarters to be in basement.
7. A separate chimney flue to be run to the cellar for future installation of a furnace.
8. Adequate provision must be made for heating the house, but furnace should not be minimum requirement. All heating fixtures, whether using gas or other fuel, must be provided with vents to flues.
9. Gas piping to be provided for kitchen range and hot water boiler.
10. *Rooms.*—One room for parents and infant child and enough rooms for other children for proper segregation of the sexes.
11. Room sizes to accommodate minimum furniture as listed. The furniture to be drawn in to scale on plans, so as not to conflict with windows, doors or hot-air registers.
12. Row or group houses to be not more than two rooms deep; except in rows where combinations of units (as one four-room, two six-room, and one four-room) allow for proper ventilation to the rooms of the deeper unit by the nature of their arrangement.
13. *Duplexes, double duplexes, etc.*—In all such units, provision shall be made for obtaining as great a degree of privacy as is enjoyed at least in the row-type house. Separate front and rear entrances, separate cellars when cellars exist, with independent plumbing lines, and heating and lighting facilities. It is also recommended that means of circulation between each apartment and private cellar be effected without going outside the house.

[1] Adapted from *Industrial Housing* (New York: McGraw-Hill Book Co., Inc., 1920), pp. 302–8. As these minimum requirements were drawn up by Mr. Knowles in 1920, a few changes doubtless now would be made to make them applicable to the advanced minimum, present-day housing standards.

14. *Closets.*—Every bedroom must have clothes closet in direct connection with it.
15. Closet or case of adequate size for keeping necessary china, kitchen utensils, staple supplies, etc., must be arranged for in kitchen.
16. *Entrances.*—There must be means of entrance other than by the front door.
17. Front porches, while desirable, are not a minimum requirement.
18. In no case should the stairs have a rise of over eight inches and tread of less than nine inches.
19. *Ventilation.*—There shall be a clear height of not less than 6 ft. 6 in. from cellar floor to under side of first-floor joist. A minimum clear story height of eight ft. shall generally obtain for first and second stories, but in cases of second-story rooms coming under sloping roofs, it shall be required that flat portions of ceiling be over an area of at least 40 sq.ft. with 3½ ft. minimum flat ceiling width and a clear height of six ft. over an area of at least 80 sq.ft. with a minimum width of seven feet. (Attic rooms not subject to these requirements.)
20. There shall be in all cases an air space, with minimum of eight in. from ceiling to roof, with provision that such space be ventilated directly to outside air.
21. Every bedroom to have at least one window opening directly to outer air.
22. One window to be sufficient for single rooms, two windows for double rooms. No room to have less than 12 sq. ft. of window area.
23. Bathroom to have one window of not less than six sq. ft. area.
24. Water-closet compartment to have one window of not less than 4½ sq. ft. opening directly to outer air.
25. Skylight may be used in lieu of window for bathroom or water-closet compartment.
26. Window frames to be of such design that screens may be used.
27. *Water supply.*—Running water to be required in connection with kitchen plumbing fixtures. (Hot water connection is desirable.)
28. A water-closet in separate compartment, properly ventilated, must be provided when bathroom is omitted.
29. While bathroom is greatly to be desired, it is not to be a minimum requirement; provided convenient and complete bath-house facilities are arranged for and properly maintained for community use.
30. Either laundry trays to be provided in cellar or combination tray and kitchen sink in kitchen.
31. Electricity to be furnished whenever possible. One switch to be provided for throwing on light on entering house and one switch to control cellar light from top of cellar stairs.

There are included in the minimum requirements such provisions as will make possible a house in which any person can live comfortably and decently. A house built under these conditions will not contain many of the

features which, while not absolutely necessary, are desired by many workmen's families.

If the term "Industrial Housing" applied only to the lowest-paid unskilled workers, it would be unnecessary to consider any but essential features; however, a large percentage of wage earners are skilled workmen, who, imbued with higher standards of living, not only desire but demand additional features in the house. They are able and willing to pay for such conveniences. It, therefore, seems necessary to arrive at some classification of houses suitable to the corresponding grades of workmen which exist in the personnel of industry.

Many persons have deemed two classifications all that are necessary—one for unskilled workers, and one for skilled workers. This differentiation, however, is considered to be too abrupt and not furnishing sufficient gradation, by men intimately acquainted with the wage earner and his family life. The native unskilled worker must often be provided with a better house than the rank and file of unskilled wage earners, and yet he cannot pay for the houses provided for higher paid skilled workers. On the other hand, if he does not have children, he probably is in a better position to afford these accommodations than the skilled worker with a very large family, who certainly will never be satisfied to drop down to the grade of house provided for unskilled laborers.

It is believed, therefore, there is considerable advantage, if not absolute necessity, in providing three grades of houses, as follows: First, a house as inexpensive as it is possible to build and still meet the demands of a home for unskilled labor; second, an intermediate grade, to meet the demands mentioned in the previous paragraph; and third, a more expensive grade, for higher wage-earning skilled laborers, shop foremen, or the higher paid men of the clerical staff.

For convenience, the three grades will be referred to respectively as Grade C, Grade B, and Grade A.

Grade C.—House shall have the minimum requirements, as before stated.

Grade B.—House shall have all the features of a Grade C house, with the following additional conveniences:

1. Room for dining, separate from kitchen.
2. Bathroom shall constitute a minimum requirement in which shall be provided the following fixtures: Enameled roll-rim bathtub, 4 ft. 6 in. by 2 ft. 6 in.; lavatory, 18 in. by 21 in.; water-closet, porcelain and wash down, syphonic action; enameled low down tank.
3. Rift sawed yellow pine floors in first floor, plain sawed pine in second floor.

4. Provision for refrigerator space adjacent to, but not in, kitchen, which may be built in compartment on rear porch.
5. Front porch, not less than 70 sq. ft.
6. Lighting fixtures in rooms, except bracket in bathroom, to be controlled by switches located conveniently at entrance doors.
7. Hot-air furnaces; cold-air returns to be taken from inside.
8. Laundry trays in basement.
9. Mechanical door bells.
10. Coal bins.

Grade A.—House shall contain all the features listed for Grade C and Grade B houses, with the following additional accommodations:

1. The rooms to be larger than the previous minimum requirements.

	Square Feet
Single bedroom	90
Double bedroom	130
Dining room	140
Living room	180

2. A coat closet shall be provided, either off hall in first floor or in connection with living room.
3. Open fireplace, with basket grate in living room.
4. Rift sawed yellow pine or oak floors in first and second floors.
5. Front porch with minimum of 96 sq. ft. Rear porch.
6. Two-way switches, for controlling one light upstairs and one downstairs.
7. Medicine cabinet in bathroom.
8. Combination gas and electric fixtures for lighting in kitchen and bathroom.

With the exception of combined uses for same room, the grading classification of the houses is not based upon number of rooms. Grade C house, for example, might contain more bedrooms than Grade A house.

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CHAPTER XVI

DESIGNING THE HOME GROUNDS[1]

ESSENTIALS IN PLANNING THE HOME GROUNDS[2]

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A plan for the grounds should first be made. This should be done before the house is planned so that the house plan and that for the grounds may fit both one another and the location. If the house is built then one must make the best of the situation.

Roads and walks should be as few as possible and should be so located as to be most serviceable and to leave the lawn areas as nearly unbroken as practicable. A straight walk direct from the street is probably best when the house is closer to the street than the width of its own front. As the distance from the street increases the desirability of so locating the walk that there is an unbroken lawn between the house and the street also increases. This often can be done by curving the walk from one corner of the lot to one end of the porch or to the entrance door. Both roads and walks should be so located and be made of such material that they will be as inconspicuous as possible.

Service features like a delivery and work yard and a clothes drying yard should be provided where they can be secluded from the general view, likewise the vegetable and flower gardens should be so located that they can be at least partially hidden from the street.

Play areas should be included in the back yard if there are children in the home. The amount of play space allotted to the play area will obviously depend upon the size of the grounds. This area need not be large but should be planned for shade and attractiveness.

Lawns should occupy as large areas unbroken by other features as the limits of the place will permit. As much as practicable of the area between

[1] The principles of design discussed in this chapter apply to small properties and to grounds of moderate size. Space does not permit information on plants and planting and such information has been included only in connection with the subject of lawns and trees.

[2] From *Beautifying the Home Grounds* (Leaflet 4). Better Homes in America, 1931.

the house and the street should be in turf to form the foreground of the picture that the house should present. These areas should be carefully graded at the start. If there are any places where there is less than the average amount of top soil a poor spot in the turf will result. Rock ledges near the surface will give the same results. Incorporate an abundance of manure or other organic matter in the soil before establishing the lawn by seeds or plants, as later feeding must be confined to the surface unless an entirely new start is made. Use the grass best adapted to the locality.

FIG. 63.—The lawn should remain unbroken by planting features. Shrubs and plants are placed preferably against foundations, at corners or in angles of steps and porches.

Start the grass when it can best meet weed competition—Kentucky blue grass and redtop in the early fall when weeds are few, Bermuda grass when warm weather arrives so that its vigorous growth will enable it to get ahead of competitors.

Trees should be located to frame the house by being placed at the corners so that the space at the middle of the front of the house is left open, or placed at the back so that they extend up over it thus giving a setting for it. They should not be too thick or crowd the front. They can be used as a frame and still give ample shade.

Shrubs should be planted against the foundations of the house at corners and in angles including the angles of the steps or of porches, also

GARDEN SCORE CARD

FRONT YARD

		Per Cent
Walks and drives:		
Location	15	
Kind and condition of surfaces	5	
		20
Lawns:		
Location and outline	15	
Evenness and purity of stand of grasses	15	
		30
Plantings:		
Arrangement	15	
Appropriateness of kinds	10	
Vigor of growth and freedom from injury	10	
		35
General care and neatness		15
		100

FRONT AND BACK YARDS

Lawns:		
Location and outline	10	
Evenness and purity of stand of grasses	10	
		20
Walks and drives:		
Location	10	
Kind and condition of surfaces	5	
		15
Service area:		
Location	5	
Surface and arrangement	5	
		10
Play area:		
Location	5	
Suitableness	5	
		10
Plantings:		
Arrangement	15	
Appropriateness of kinds	10	
Vigor of growth and freedom from injuries	5	
		30
General neatness		15
		100

at intermediate points of long straight sides. Such plantings should not be continuous along the whole foundation of any side of the building nor should the different clumps be uniform as to size, height or breadth, or composed of the same kinds of plants. By this means variety and interest will be provided.

Another appropriate location for shrub planting is in clumps along the boundaries. These, too, should be irregular as to size, varying in width and in height and be composed of different kinds of plants. The corners and the entrances are especially worthy of emphasis and should be adorned with plantings. Junctions of walks and drives and the insides of curves are other appropriate locations for shrub groups. But care must be used not to create danger points by having such plantings so high that they obstruct the view of traffic. The screening of service areas and the partial seclusion of garden areas may be secured by using such plants either as irregular masses or as hedges.

Vines may be used on fences, arbors or trellises about the home or even against the buildings or on the porch. Care must be used not to smother the house by their use.

Herbaceous perennials may be used here and there in the edges of the shrubbery groups to add bright colored flowers at times when the shrubs are not flowering, also in special borders arranged as part of the border plantings or in beds or borders in the flower garden.

Annual flowers may be used as little clumps here and there in the edges of the shrubbery to add color through midsummer and early fall, or may be used to supplement perennials in the border or for planting the flower garden.

Plants should be selected that are known to thrive in the locality. Those listed in the catalogues of nearby nurserymen are usually safe. Native plants and those commonly grown in the community should form the nucleus of the plantations. Cone-bearing evergreens may often be used freely in the north and broadleaf evergreens in the south.

PRINCIPLES OF SMALL-PROPERTY DESIGN[1]

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Landscape architecture is a complex and profound art, serving not beauty alone but utility, and demanding the assistance and coöperation of architecture, engineering and horticulture. Landscape architecture is an art of design—the arrangement of buildings, drives, walks, gardens, lawns and plantings in the landscape. Planning is its most important function although too many persons consider it to be merely planting. Planting and the selection of plants is indeed an important part of the execution of the designs, but it is no more so than the proper placing of a walk or road and often of much less importance than the location of a building. . . . . If the size and shape and arrangement of the rooms of a house are more fundamental considerations than the paper and paint, then surely the arrangement of the elements that make up the home grounds is of vastly more importance than the planting, most of which is merely a frame, a decoration, and aid to something else. The wallpaper and the plantings can be rather easily changed, but buildings, fences and walks will probably remain in their first location.

The fundamental purpose of all the arts is to give pleasure to the persons who see or use that which is created. From our knowledge of human psychology, we know that we are affected by everything about us. To see color, to hear a sound, involuntarily arouses the emotions and produces either pleasure or displeasure. Should we discover that the source of color is a bed of flowers or that the sound is a familiar melody, we receive even greater pleasure. Perhaps these flowers or this melody recall something we have seen or heard; perhaps they will arouse in our imagination beauties far beyond those that really exist. All these pleasures have been practically involuntary, differing, of course, with our training, our experience and our taste. Another source of pleasure to most persons and one that differs much with individuals is that obtained from reasoning or inquiring how the result was accomplished. The practical-minded person observes how the fence is made, how the steps or the walk is constructed and how the soil is improved for planting. He delights in good workmanship, in seeing a problem sensibly solved. As most of us are practical but yet have

[1] Adapted from *The Design of Small Properties* by permission of the Macmillan Company, publishers (New York: Macmillan Co., 1929), 1–19. This publication contains over sixty planting plans and diagrams—both formal and informal and suitable for the design of small grounds. These planting plans have been prepared for lots of various size and shape.

somewhere in our make-up an imaginative side, so must our landscape design, to give greatest pleasure, combine utility with beauty.

Planning for space is the chief consideration in small, city homes. The landscape development of small properties needs the attention of persons of good taste and training, and, above all, should be executed with restraint. If there is any place where too little is better than too much, it is in small yards

It should be understood in the beginning that a small place cannot be a large estate in miniature. The small yard must be simple. The size of human beings does not differ much, neither does the size of things they use. The furniture in a small living room has about the same dimensions as that in a large room; there is only less of it, each piece being in scale with man. Thus it becomes a fundamental consideration of small-property designs that they contain fewer features than larger places, but that each detail shall be "in scale."

In many respects, the design of small lots is different from that of larger home grounds, for the necessary parts, such as the driveway, garage, drying-yard and vegetable plot, take a much greater proportion of space. Small places, then, need even more careful planning than large ones for the best results; they are to be compared to small houses in which not an inch can be wasted. There the living rooms are given the maximum amount of space, the kitchen and sleeping quarters being reduced to a minimum; here the necessary drive and service parts will be made as small and compact as possible in order to give all the ground gained by planning to recreational or "living room" use. Spaciousness is the effect one tries to produce on the small property.

The problem of the small place is mainly one of planning, not planting. Planning should start even before the lot is purchased. Persons usually have fairly definite ideas about the style of house they will build. If they already own a lot, the house must be made to fit it in size and shape; if the house is chosen first, then a lot must be found suitable to its type and shape. Ideally both selections should go on together.

The similarity of shape and surface in most city and suburban lots does not suggest any particular scheme for development. The location and plan of the house and the position of the garage are the factors that usually determine the dispensation of the remainder of the property for use and beauty. Why, then, are both house and garage so often placed without any thought as to how they will affect the design of the yard? Why do most persons select house plans, for interior convenience only, when the

convenience between inside rooms and their corresponding outdoor areas is fully as important? Surely, if home-owners realized the possibilities of greater use and enjoyment which can be obtained, they would plan the house and grounds together.

There should be nothing displeasing in the masonry foundations of buildings. It is true that many houses have been built too high above ground and concealment of this fault is attempted by continuous planting about the foundation. But one evil seldom cures another. If the grade line is too low, it should be raised by making a terrace about the front of the house. A good maxim is to use vegetation merely to soften, to enframe, or to add a touch of decoration. The eye is accustomed to seeing houses setting upon their foundations, and a stretch of the wall here and there is rather satisfying.

It is assumed that the average home-owner likes room for vegetables but does not care for a large garden. On deep lots, the vegetable plot placed across the rear cuts down an excessively deep lawn; on shorter wider properties, even on sixty-foot lots, this space is needed to make long attractive lawn lines and the vegetables may be along the side of the lot, just behind the garage or drying-yard. This vegetable garden may profitably be surrounded by grapes or currants or even black raspberries, and often the vegetables and flowers are combined into one larger garden across the rear of the property.

The ideal place for a small flower garden is at the side of the house adjoining the living room if the lot be wide enough. In the case of fifty-foot widths usually this is not possible. . . . . Often a complete little flower garden may be in the rear, or if this space is needed for vegetables, a border of flowers may be made across the back or better along one side of the lawn. Whether the flowers are in a garden or bordering the lawn, the beds should be ample, not two or three feet wide as is often attempted, six feet being the minimum perhaps. Narrow beds, narrow paths, diminutive details in general make a fussy garden and reduce the scale of the entire property instead of increasing the feeling of extent so desirable on the small place.

For the best landscape development, it is important that the living room should overlook the side or rear lawn and have an exit to these areas. This opening may be from the living room or sun porch and enter directly into the open lawn or, better still, out upon a porch or terrace from which the lawns and gardens are accessible. To make the lawn and garden a real

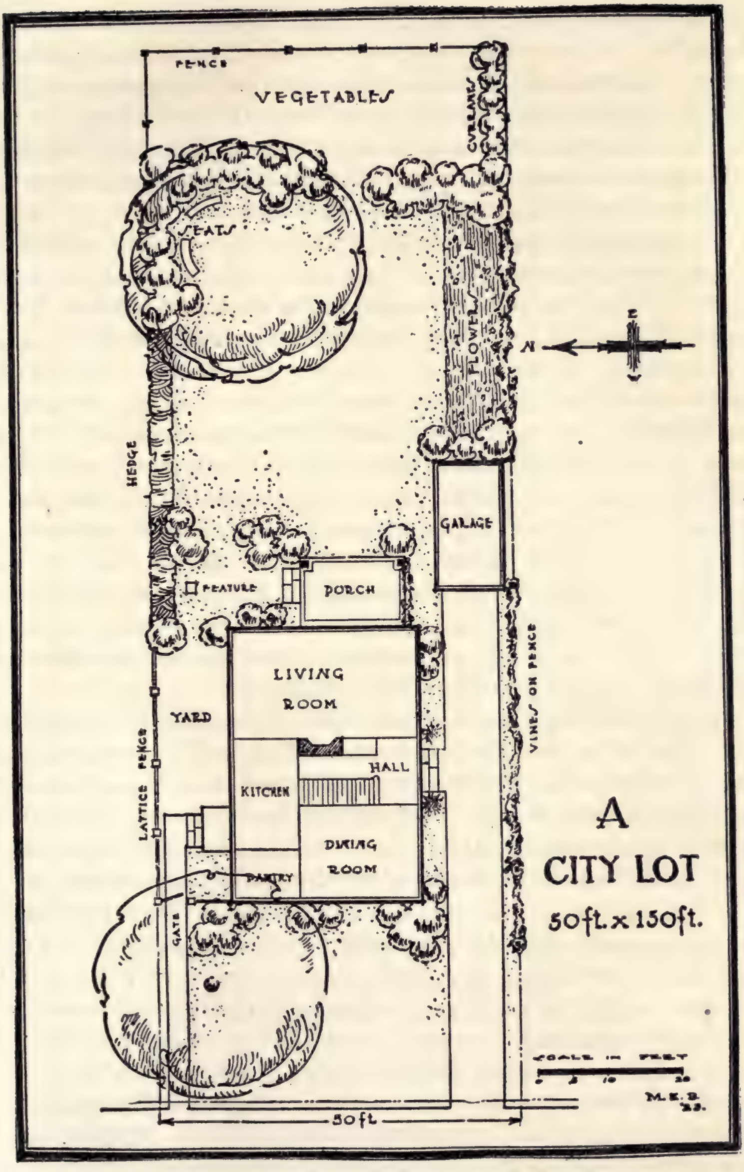

FIG. 64.—An interesting treatment of a typical city lot with easy access from the living room to the garden. (Courtesy of M. L. Bottomley. Reprinted from *Design of Small Properties* [Macmillan].)

part of the house, there must be a direct connection between them and the inside. Too often the living room does not have even a view of the outside pleasure area. Why make it awkward for your guests and you to reach the garden? Why should it be necessary to take them out the front entrance and around the house or through the kitchen door? People like to be outside in pleasant surroundings; they will go into their own private outdoors often, if it is easy for them to get there.

The rear lawn is the outdoor living room of the property—pleasant to look at from the house, a broad space for out-of-door life, a playground for the children, the dominating area in the whole composition. The seclusion of the entire rear yard is important, for unless privacy is secured in some degree, the use for which the lawn was intended is defeated. The smaller the lot the higher must be the boundary to secure seclusion and the narrower it must be to save space. On small lots, a wall, a lattice fence, a wire fence with vines growing over it are suggested as most economical of space. Next in usefulness is the trimmed hedge, then the untrimmed or restrained hedge, and on the larger lots the shrub border planted in two staggered lines parallel to the property line and only wide enough at all points to secure privacy. The informal shrubbery border with its curved outline has been copied from larger estates and parks where a long straight line of planting becomes monotonous. No line is sufficiently long on the small place to be tiresome.

Straight lines emphasize long dimensions and express greater scale. For this reason, a hedge rather than a variety of plants is preferred as a background and boundary. Great variety of plants is not in good taste on a small area; objects of interest to be given prominence and to be enjoyed must be furnished with ample neutral framing material. Consequently, one type of plant or at least one type of foliage should predominate.

In the design of the rear lawn, not only the lines of the enclosure should be approximately parallel to the property line but, commonly, the lines of the other elements also. Whatever general arrangement is planned, the major part of the rear yard should be kept open and this open space should adjoin the living rooms. Cramped quarters next to the house on both sides of the living room ruin the scale and feeling of spaciousness which is desired for the observer inside. Most of the detail can be introduced around the edges of the lawn and not materially reduce its size. All possible lawn area should be seen in this general view to give the feeling of extent, and yet the well-designed back yard must have features or areas wholly or partly hidden from the main line of sight—something held in reserve.

Mystery is a pleasing challenge to the individual, to investigate what is concealed from his first glance.

A garden, then, close to the house and enclosing the only view and exit from the living rooms is wrong. The appearance of the rear yard will seem as large as this garden; even though there be a lawn beyond, it is lost in the picture because interest is held by that which is more spectacular—the garden. If the lawn were next to the house and the garden beyond, it would serve as a part of the garden picture—the foreground to it. The whole yard would be larger; there would be an incentive to go out into the garden to see it more closely; the presentation of the garden from the house would be a general not a detailed picture. These results are all desirable.

In small yards there is a great advantage in an unsymmetrical arrangement—that balancing of one feature by a different one rather than repeating the same on both sides of the axis. A wide border of perennials on one side of a lawn may be balanced by a hedge, a fence, evergreens, a tree or an arbor that encroach little on the width of lawn but still effect balance with the ample flower border.

Some such asymmetrical scheme is better than dividing the flower border into two narrow beds too small for growing flowers well. The modern house with its living room on one side and service on the other usually calls for this unsymmetrical composition, as the axis from the living room or porch will not be in the center of the back yard. This does not mean that the symmetrical scheme for both house and grounds does not have a place. But on the whole, the balance secured without repetition is more suitable for the small property because it is more subtle; and there is little enough chance to be clever in such small space. But naturally, satisfactory balance in this unsymmetrical arrangement is more difficult to obtain.

LAWN MAKING AND LAWN RENOVATION[1]

By FURMAN LLOYD MULFORD
Associate Horticulturist, U.S. Department of Agriculture

LAWN MAKING

The foundation for a good lawn is a rich, deep, well-drained soil, retentive of moisture. There should be at least eight inches of good topsoil over any subsoil used or exposed in grading the lawn. As it is impossible to

[1] Two mimeographed circulars, "Lawn Making" and "Renovating the Lawn," issued by the Office of Horticulture, U.S. Department of Agriculture, 1925.

incorporate organic matter in the soil after the lawn is seeded, it is important that an abundance be added in the preparation. The best material is manure, so composted that all weed seeds have been killed without having its value destroyed by burning. From one to two pounds per square foot, or 20 to 40 tons per acre, should be used, but where this is impossible to secure, the turning under of green crops is the alternative. Crops suitable for this purpose are various clovers, vetch with rye, Canada field peas with oats, soy beans and cow peas, the latter having the additional value of crowding out many lawn weeds. A full discussion of green manuring appears in Farmers' Bulletin No. 1250 entitled "Green Manuring." Commercial fertilizers applied to soil-improvement crops often wonderfully stimulate their growth. From 500 pounds to 2 tons per acre of $\frac{1}{8}$ to 1 pound for each 10 square feet of mixed fertilizer may be used depending on the condition of the soil. After the soil has been well enriched, it should be well prepared by deep plowing or spading and pulverizing and then permitted to settle for three or four weeks when the top $1\frac{1}{2}$ inches should be made into a very fine seedbed.

The grass to be used depends on the section of the country. Kentucky blue grass is probably the best lawn grass in the northeastern fourth of the country, farther south in shady places, in the Allegheny Mountains, in the Puget Sound Region, on the Pacific Coast and in many irrigated sections. In warmer and in sandy regions the bent grasses, including the creeping bent and Rhode Island bent are likely to succeed; farther south, the Bermuda grass is to be depended on; along the South Atlantic Coast and the Gulf of Mexico carpet grass and St. Augustine grass are best, while in the Mississippi Valley the mesquite grass, one of the bent grasses, is excellent.

Where Kentucky blue grass is used it is necessary to sow some other grass to give a temporary effect for about three years or until the blue grass becomes well established. Red top is usually used with the blue grass for this purpose either equal parts by weight or two parts blue grass to one of red top. The mixture should be sown at the rate of 100 pounds per acre, or one pound for every 400 square feet, and the bent grasses used in the same amounts. Red fescue is useful for shade and can be sown where the blue grass does not seem to give the required result, or it can be used in combination with it.

Seed is probably best sown in the fall, three months before the ground may be expected to freeze. This usually coincides with a period of liberal rains. Spring sowing should be done very early while the ground freezes

at night but thaws during the day. The seed should be covered very lightly, and if the ground is dry it should be rolled after planting.

Bermuda grass, carpet grass, St. Augustine grass, mesquite grass and sometimes creeping bent grass are established by transplanting runners that have rooted at the joints. This is best done in the fall two months or more before the freezing weather. They will spread rapidly, often three feet in a single season under favorable conditions.

The cutting of the lawn should begin as soon as the lawn mower will clip the ends of the grass when it is set as high as possible and should follow at sufficiently frequent intervals to permit the clippings to remain on the grass. Short clippings left on the lawn will quickly work down to the surface of the ground where they will aid materially in maintaining good conditions for grass growth.

Applications of ground bone, fish scrap, tankage, cotton-seed meal or other highly nitrogenous fertilizer should be applied liberally each fall from 500 pounds to a ton per acre or 5 to 20 pounds to each 400 square feet according to the condition of the soil. Nitrate of soda or sulphate of ammonia may be used as a summer stimulant at the rate of 50 pounds per acre or 1 pound for 800 square feet at intervals of a month during the growing season either dissolved or when the soil is wet.

RENOVATING THE LAWN

If there is a partial stand of grass on the lawn, even though the ground is not more than one-fourth covered, the best plan is to seed freely about twice a year and apply suitable fertilizers at frequent intervals. When the soil is composed partially of clay or has a clay subsoil, then Kentucky blue grass and red top should be suitable to use in equal quantities, by weight. If in shade add as much red fescue as either of the other grasses. If, however, the soil is largely sand, red top, red fescue, and, if obtainable, creeping bent or Rhode Island bent should be used in equal parts by weight. German bent seems to be the most available seed. Kentucky blue grass seems to do better in an alkaline soil which can be assured by applying lime or unleached wood ashes at the rate of 5 to 10 pounds per 100 square feet. If there is one-half a stand of grass it would be well to use seed at the rate of 50 pounds per acre or one pound for every 1,000 square feet of surface. If there is a less stand of grass, then more seed should be used. It would probably be well to seed before freezing weather is over in the spring and two months before freezing weather in the late summer or fall.

To stimulate as vigorous a growth of grass as possible a liberal application of compost, ground bone or one of the prepared stockyard manures, like sheep manure or prepared cow manure, should be broadcast on the surface. In the case of bone, this would be from 1 to 1½ tons per acre, or from 5 to 7½ pounds per hundred square feet, and of the prepared manures an even larger quantity. The application should be repeated late each fall. After the grass has well started, nitrate of soda could be used to advantage at the rate of 50 pounds per acre, or 2 ounces per 100 square feet when the ground is wet either from rain or from watering, or it may be washed in by watering immediately after application. It can be used as a stimulant from June to September at intervals of a month. Reseeding is desirable each spring and later summer or fall until a really good lawn is secured, when it might do to omit one seeding.

Clipping of the lawn with a lawn mower should begin as soon as it will cut the tops when set high and should be repeated at intervals of five days or a week. The clippings should be permitted to remain about the roots of the grass.

Watering should not be oftener than once in five days but should wet the soil to a depth of four inches when applied. Usually watering is too light and too frequent.

FOUNDATION PLANTING[1]

By FURMAN LLOYD MULFORD

Associate Horticulturist, U.S. Department of Agriculture

A house must be comfortable and attractive both inside and out to be a real home. It may be modest and simple, but it must be neat and in good repair. In addition it must give the feeling of belonging to its surroundings. Nothing contributes so much to this appearance as appropriate plantings about the foundations.

A house rising directly from the bare ground or even from a good lawn with all the foundation showing is usually unattractive and uninviting. If on the other hand an old lilac bush has run wild at one corner of the house and if but an elder bush and blackberry tangle have clothed another corner, the severe straight lines are softened and the house has a look of belonging in its surroundings and begins to look as though it was at home there. The transformation from a bare and uninviting building to a home-

[1] Mimeographed circular issued by the Office of Horticulture, U.S. Department of Agriculture.

like picture is easily accomplished by appropriate plantings about the foundations.

The most important locations for plant groups are the most prominent points. These are often the front corners of the house or of the porch, or a large bare wall unbroken by windows. At these points the largest or most conspicuous plants should be used. Of lesser prominence may be the entrance steps or angles in the house, where smaller plants are usually appropriate. Under the windows of a long wall only those plants should be used that will grow as high as the window sills, while in liberal spaces between windows those may be used that will grow to the top of the window or above. Plants used along a porch where it is desirable to maintain an open view should not exceed a height of 30 inches above the floor, so that those sitting on the porch may see over them. Higher shrubs may be used for screening or for making an appropriate setting for a conspicuous porch corner.

Plants of different heights should be used so the top outline will vary and thus be more interesting; also the width of the plantings should vary for the same reason. This frequently makes possible the planting of large plants next the building with smaller ones on the outer edge of the groups. This need for variety of outline makes inappropriate the planting of a row of plants of one kind along a porch or a house wall. It is also inadvisable to plant continuously along a foundation even with plants of different habits, as the most pleasing appearance is obtained by exposing a portion of the foundation so that the house may be seen to be resting on something substantial instead of appearing uncertainly suspended among waving foliage.

Variety may also be obtained by using plants of different forms of growth, some upright, some spreading, some drooping, also with plants having different form and color of leaves, as large or small, entire or lobed, dark green, pea green or grayish, glossy or dull. Shrubs are also available with different types of branching, different colors of stems, different habits as to holding leaves, some remaining on for two or three years, others dropping each fall, and with crops of bright-colored fruits following the flowers.

Many combinations of these plants may be used, any of which would make a pleasing appearance. They must be carefully selected, however, to obtain those of appropriate size for the locations as well as to provide variety.

SELECTION AND PLANTING OF TREES[1]

By LEWIS C. EVERARD

Editor of *Forest Service*

A few general principles should always be kept in mind in selecting trees to plant. Every species has a characteristic habit of growth and it is desirable to select trees which have the greatest natural beauty of form consistent with hardiness and freedom from disease and insect pests in the location where they are to be planted. In the case of deciduous species the tree in winter may well be the basis, at least in part, of this choice, for then the eye is not distracted from consideration of form by the beauty of the leaves. The form chosen not only should be beautiful, but should harmonize with the position in which the tree is to be placed; as, for instance, narrow columnar crowns for narrow streets, broad spreading crowns for wide avenues, evergreens, in most cases, for screens, and deciduous trees near dwellings or schoolhouses. Native trees are often to be preferred, for the reason that they are known to flourish under the soil and climatic conditions of the region. Long-lived species, tough species that will not easily break or drop branches in high winds, and disease-resistant trees and those free from insect pests, are to be sought. Trees that sprout from the roots, such as poplar and black locust; have disagreeable odors, such as ailanthus; or are untidy or lose their leaves early, are in most cases to be avoided.

SOME SUITABLE TREES FOR PLANTING

The species included in this list are generally hardy in the State indicated, though for any particular site it is best to obtain the advice of local or State authorities. The list is only suggestive and the absence of any species does not necessarily mean that it is unsuitable.

Alabama.—Native pines, live oak, willow oak, laurel oak, evergreen magnolia, holly, red (sweet) gum, and dogwood.

Arizona.—Arizona and smooth cypresses, American elm, Chinese elm, native cottonwood, silver-leaf poplar, honey locust, box elder, Arizona sycamore, green ash, black locust, hackberry, and tamarisk.

Arkansas.—Chinese arborvitæ, shortleaf pine, white oak, black oak, willow oak, sugar maple, red maple, evergreen magnolia, American elm, hickories, hackberry, red (sweet) gum, and holly.

California.—Foothills regions—Lawson cypress (Port Orford cedar), deodar

[1] Adapted from *Arbor Day—Its Purpose and Observance.* Farmers' Bull. 1492. U.S. Department of Agriculture, 1926.

cedar, California juniper, Monterey cypress, big tree, London (Oriental) plane, incense cedar.

Coastal region.—Aleppo pine, Monterey pine, redwood, Monterey cypress, English elm, California sycamore, London (Oriental) plane, California walnut, Madroña, bigleaf maple, California live oak.

Valley region.—Incense cedar, big tree, Monterey cypress, coulter pine, Norfolk Island pine, deodar cedar, English elm, valley oak, blue gum, red gum, California sycamore.

Colorado.—Plains region—Western yellow pine, Rocky Mountain red cedar, American elm, Chinese elm, honey locust, hackberry, Russian olive, silver poplar.

Mountain region.—Blue spruce, Douglas fir, white fir, western yellow pine, native cottonwoods, and box elder.

Connecticut.—Norway pine, white spruce, white oak, red oak, black oak, pin oak, sugar maple, red maple, Norway maple, white ash, American elm, sycamore, black walnut, horse chestnut, basswood, beech, and canoe (paper) birch.

Delaware.—Norway spruce, white spruce, arborvitæ (northern white cedar), southern white cedar, eastern hemlock, white oak, black oak, pin oak, willow oak, sugar maple, Norway maple, red maple, white ash, holly, black elder, Lombardy poplar, American elm, red (sweet) gum, London (Oriental) plane, beech, basswood, and weeping willow.

Florida.—North—Live oak, laurel oak, Washington palm, Canary Island date palm, cabbage palmetto, slash pine, and longleaf pine.

South.—Australian pine, silk oak, evergreen magnolia, coconut and royal palms.

Georgia.—Deodar cedar, bald (southern) cypress, Carolina and eastern hemlocks, white oak, black oak, willow oak, laurel oak, pin oak, post oak, live oak, red maple, sugarberry, redbud, fringe tree, sweet gum, sweet bay, holly, and evergreen magnolia.

Idaho.—Blue spruce, Engelmann spruce, white fir, Douglas fir, Rocky Mountain red cedar, jack pine, western yellow pine, paper birch, Norway maple, sycamore maple, green ash, weeping willow, black cottonwood, narrow-leafed cottonwood, aspen, Balm-of-Gilead poplar, hackberry, box elder, American elm, cork elm, honey locust, and black locust.

Illinois.—White pine, Norway spruce, arborvitæ (northern white cedar), European larch, swamp white oak, black oak, bur oak, pin oak, red oak, Norway maple, sugar maple, tulip tree (yellow poplar), sycamore, basswood, black walnut, American elm, hackberry, shellbark and bitternut hickories, and ginkgo.

Indiana.—Arborvitæ (northern white cedar), white oak, red oak, pin oak, sugar maple, Norway maple, red maple, basswood, swamp white oak, black walnut, tulip tree (yellow poplar), sycamore, American elm, and ginkgo.

Iowa.—Arborvitæ (northern white cedar), Norway spruce, white pine, white oak, pin oak, red oak, paper birch, Norway maple, sugar maple, American elm, sycamore, hackberry, and white ash.

Kansas.—Chinese arborvitæ, Scotch pine, pin oak, green ash, hackberry, honey locust, Russian olive, sycamore, black walnut, American elm, and Chinese elm.

Kentucky.—Pin oak, red oak, bur oak, overcup oak, Norway maple, sugar maple, red maple, white ash, sycamore, basswood, tulip tree (yellow poplar), ginkgo, black walnut, cucumber magnolia, and hickories.

Louisiana.—Southern cypress, laurel oak, live oak, southern red oak, post oak, evergreen magnolia, winged elm, sugarberry, sycamore, and red (sweet) gum.

Maine.—European larch, arborvitæ (northern white cedar), red spruce, white spruce, red pine, red oak, paper birch, red maple, American elm, thorn tree, beech, and basswood.

Maryland and the District of Columbia.—Arborvitæ (northern white cedar), white oak, pin oak, red oak, willow oak, Norway maple, red maple, London (Oriental) plane, American elm, basswood, European lindens, tulip tree (yellow poplar), beech, dogwood, red (sweet) gum, and ginkgo.

Massachusetts.—White pine, red pine, white spruce, red spruce, arborvitæ (northern white cedar), red oak, pin oak, European and native white birches, sugar maple, Norway maple, mountain ash, European lindens, London (Oriental) plane, American elm, horse chestnut, beech, black walnut, and butternut.

Michigan—White pine, red pine, arborvitæ (northern white cedar), Norway spruce, eastern hemlock, balsam fir, red oak, bur oak, yellow birch, sweet birch, sugar maple, red maple, American elm, rock elm, and beech.

Minnesota.—Norway pine, white pine, white spruce, arborvitæ (northern white cedar), paper birch, sugar maple, red maple, green ash, white ash, American elm, basswood, and box elder.

Mississippi.—Laurel oak, willow oak, live oak, southern red oak, sugarberry, winged elm, sweet gum, evergreen magnolia, sycamore, and holly.

Missouri.—Shortleaf pine, oaks, sugar maple, red and green ashes, American elm, hackberry, red (sweet) gum, tulip tree (yellow poplar), black gum, evergreen magnolia, holly, and redbud.

Montana.—Douglas fir, Engelmann spruce, Rocky Mountain red cedar, green ash, cottonwoods, box elder, and black locust.

Nebraska.—Western yellow pine, Scotch pine, jack pine, bur oak, green ash, honey locust, hackberry, Russian olive, American elm, and native cottonwoods.

Nevada.—Black locust, Chinese popular, box elder, tamarisk, native cottonwoods, and Chinese elm.

New Hampshire.—Norway and white spruces, red pine, white pine, paper birch, sugar maple, white ash, American elm, beech, and basswood.

New Jersey.—Pin oak, red oak, white oak, Norway maple, green ash, American elm, hackberry, European linden, honey locust, black locust, tulip tree (yellow poplar), sycamore, black walnut, London (Oriental) plane, red (sweet) gum, and black gum.

New Mexico.—Green and Arizona ashes, native cottonwood, black locust, Russian mulberry, tamarisk, Russian olive, and Chinese elm.

New York.—White spruce, blue spruce, white pine, Scotch pine, red pine, balsam fir, eastern hemlock, arborvitæ (northern white cedar), white oak, black oak, red oak, pin oak, basswood, beech, sugar maple, Norway maple, and American elm.

North Carolina.—Loblolly pine, longleaf pine, white oak, black oak, post oak, southern red oak, evergreen magnolia, holly, hickories, black walnut, redbud, tulip tree (yellow poplar), sycamore, red (sweet) gum, and basswood.

North Dakota.—Jack pine, Scotch pine, western yellow pine, bur oak, green ash, white willow, box elder, black walnut, American elm, hackberry, balsam poplar, Norway poplar, and Russian olive.

Ohio.—European larch, white pine, Scotch pine, Norway spruce, blue spruce, white spruce, arborvitæ (northern white cedar), white oak, red oak, pin oak, black oak, white birch, sugar maple, Norway maple, red (sweet) gum, tulip tree (yellow poplar), horse chestnut, beech, and basswood.

Oklahoma.—Chinese arborvitæ, American elm, winged elm, cottonwood, Russian olive, Russian mulberry, black walnut, Osage orange, black locust, sycamore, and London (Oriental) plane.

Oregon.—Western white pine, western yellow pine, Douglas fir, Norway maple, bigleaf maple, green ash, Russian poplar, white willow, English elm, black locust, and box elder.

Pennsylvania.—Red pine, arborvitæ (northern white cedar), Norway spruce, red oak, pin oak, European white birch, paper birch, sweet birch, red maple, sugar maple, Norway maple, tulip tree (yellow poplar), American elm, slippery elm, black walnut, sycamore, beech, and hickories.

Rhode Island.—White oak, black oak, bur oak, river birch, European white birch, red maple, sugar maple, Norway maple, American elm, yellow poplar (tulip tree), black walnut, and hickories.

South Carolina.—Bald (southern) cypress, live oak, willow oak, laurel oak, southern red oak, red maple, redbud, sugarberry, sycamore, basswood, tulip tree (yellow poplar), evergreen magnolia, ginkgo, pecan.

South Dakota.—Rocky Mountain red cedar, Scotch pine, jack pine, western yellow pine, green ash, American elm, box elder, native cottonwoods, Russian olive, and hackberry.

Tennessee.—Eastern hemlock, southern cypress, willow oak, red oak, white

oak, pin oak, sugar maple, red maple, American elm, tulip tree (yellow poplar), basswood, sugarberry, black gum, red (sweet) gum, evergreen magnolia, and hickories.

Texas.—East—Bald (southern) cypress, longleaf pine, Chinese arborvitæ, pin oak, post oak, southern red oak, black oak, Texas red oak, willow oak, live oak, green ash, sycamore, American elm, cedar elm, red (sweet) gum, sugarberry, pecan, and evergreen magnolia.

West—Alligator juniper, one-seed juniper, green ash, Texas ash, native cottonwoods, Chinese elm, tamarisk, China tree, Texas umbrella tree (umbrella China tree), black locust, box elder, nogal and Mexican walnut, Osage orange, hackberry, western soapberry, and desert willow.

Utah.—Blue spruce, Rocky Mountain red cedar, western yellow pine, Scotch pine, jack pine, Austrian pine, silver maple, green ash, black locust, hackberry, sycamore, box elder, and native cottonwoods.

Vermont.—Balsam fir, tamarack, white spruce, white and red pines, sugar and Norway maples, American elm, beech, yellow birch, and basswood.

Virginia.—White and red oaks, black oak, willow oak, southern red oak, red maple, red and green ashes, horse chestnut, winged and American elm, black walnut, sycamore London (Oriental) plane, tulip tree (yellow poplar), basswood, dogwood, ginkgo, and honey locust.

Washington.—East—Western yellow pine, Rocky Mountain red cedar, cottonwoods, and box elder.

West—Douglas fir, western yellow pine, western white spruce, western white pine, Port Orford cedar, lowland white fir, Garry oak, paper birch, bigleaf maple, and madrona.

West Virginia.—White pine, tamarack, red spruce, eastern hemlock, arborvitæ (northern white cedar), pin oak, red oak, yellow birch, sugar maple, white ash, black walnut, American elm, cucumber tree, red (sweet) gum, redbud, holly, basswood, Hercules-club, flowering dogwood, and fringe tree.

Wisconsin.—Norway pine, white pine, white spruce, Norway spruce, arborvitæ (northern white cedar), white oak, bur oak, red oak, beech, yellow birch, paper birch, sugar maple, white ash, American elm, and basswood.

Wyoming.—Western yellow pine, Rocky Mountain red cedar (*Juniperus scopulorum*), lodgepole pine, blue spruce, green ash, box elder, American elm, Chinese elm, native cottonwoods, and Russian olive.

PLANTING SUGGESTIONS

The proper season for planting is not everywhere the same. Where spring is the best season—north of the thirty-seventh parallel generally—the right time is when the frost is out of the ground and before budding or growth begins.

Trees cannot be thrust into a rough soil at random and expected to

flourish. They should be planted in well-worked soil, well enriched. If they cannot be set out immediately upon receipt, the first step is to prevent their roots from drying out in the air. This may be done by "heeling in" the trees—that is, burying the roots in fresh earth and packing it enough to exclude the air. Evergreens in particular, which are always transplanted with a base of earth about the roots, are very easily killed by allowing the roots to become dry. Before planting cut off the ends of all broken or mutilated roots; if it is a broadleaf tree, prune the tree to a few main branches and shorten these. Evergreen trees should not be pruned.

Dig holes at least three feet in diameter and two feet deep. If the soil is poor, they should be four feet in diameter. Make the sides perpendicular and the bottom flat. Break up the soil in the bottom to the depth of the spade blade. Spread on the bottom 12 or 15 inches of good topsoil, free from sods or other undecomposed vegetable matter. On the top of this layer spread out the roots of the tree with none of them in a cramped position and cover them with two or three inches of fine topsoil. Firm the soil about the roots, water lightly, and after the water soaks in fill the hole with good earth, continuing to firm it, but leaving the surface loose and a little higher than the surface of the surrounding soil.

When planted the trees should stand about one inch deeper than they stood in the nursery. They should be planted far enough apart so that at maturity they will not be crowded. This is especially important, for the trees will not grow well unless they have an adequate supply of light and moisture.

Young trees should not only be properly transplanted but should be cared for until they become so well established that they will grow without danger of dying of neglect.

CONSIDERATIONS IN PLANNING THE FLOWER GARDEN[1]

By H. W. HARVEY

Horticulturist, Georgia State College of Agriculture

Almost anybody likes flowers, whether he is willing to acknowledge his liking or not. The one who claims to care nothing for them may be influenced in his dislikes by arrangement, or lack of arrangement. Flowers in the wrong place or skimpy planting make a poor impression, but flowers in mass, *quantities* of them as one sees them by the roadside, or in an old field, or in the woods, nature's arrangement cannot fail to make a good impression.

[1] Adapted from *Flower Beds* (mimeographed leaflet). Georgia State College of Agriculture.

The front yard is no place for a flower bed. The simplicity of a clear unbroken lawn always makes for beauty. The sweep of a large lawn is restful, cool and inviting. The smaller the lawn, the greater the reason for keeping it unbroken. It may be formal with straight walk and neat edging or with border and a formal planting at the base of the house, but there is never an excuse for breaking it with flower beds or specimen shrubs except one's own personal taste and, since the front of the house is necessarily public, one should keep to the privacy of the rear or side yard for the expression of one's personal likes.

The flower garden in the back or side yard may need to be formal because of little room. It may be laid out in any design one chooses and planted to the flowers one likes, in any combination. It is a personal matter and no one else's business. No outsider has a right to criticize. In the formal garden one may use sheared shrubs, but they are out of place in the front yard. Many a pretty group is spoiled because the individual plants that compose it are picked out by being sheared to some unnatural shape, thus calling attention to the individual rather than the mass, of which each plant is only a part: To use an athletic expression, "team work spoiled by star playing."

Straight lines are simpler and more easily kept than curved, and so may be said to be more restful. The beds may be raised or level with the walks as one prefers, but while a raised bed drains better than a flat one, it also dries out quicker. The beds may be edged with brick or stone or any other material that will hold its shape. An uneven edge made of stone or brick, set each overlapping another so that the corners stand up, is hard to keep neat, especially if grass surrounds the bed, and brick so set are forever getting out of place. A concrete edge is straight and smooth and permanent, but sometimes one wants to change the pattern of the garden and then one wishes the edging made of hard brick set on end well into the ground so they will hold their places until one wants to change them.

Some people plant for show and in trying to attract the attention of the outsider they neglect their own pleasure. The outsider is a transient, and while one wants him to find his surroundings attractive as he journeys past, one ought to consider that those who are inside are due the greater consideration, and so the place should be most attractive to the insider who stays and who sees it day after day and year after year.

Nature is lavish with the flowers, scattering informally without thought of color or size of growth, yet never making mistakes in her combinations.

Something of the natural may be attained even in the smallest yard by arranging the flowers along the border. Flowers show to best advantage

FIG. 65.—Flowers often are planted at regular intervals with repetition of masses or a repetition of color. (Courtesy of *House Beautiful* magazine.)

against a background of some sort. That may be a fence or a building, but if it be a living background of trees or shrubs, so much the better.

The foliage of the woody plants contrasts favorably in texture and color with the flowers and foliage of the herbaceous plants, making a pleasing effect that is not gained otherwise. A well-trimmed grass plot in the back yard, surrounded by a screen of shrubs lined with beds of flowers, affords privacy and seclusion, a delightful place for quiet reading or an afternoon tea or an evening party, a place where one may dig and plant and weed unmolested and unseen by the passer-by.

There is no rule for the shape of the border beds, or for the choice of flowers, or for their arrangement or combinations. Some plants do better in full sun and others in shade or partial shade; some like moisture while others prefer a dry location, but all respond to good treatment in the form of a well-prepared fertile soil and many a surprise will be found in plants growing under conditions other than those of their native haunts. There are plenty of native flowers that are quite the equal of expensive exotics. Many of the natives are grown by seedsmen and the seeds listed in the catalogues. Others are still growing wild in profusion, and still others that are threatened with extermination as new ground is cleared and brought into cultivation. Some of them may be weeds in the field, but in the border they are not, and each fills its place satisfactorily. It is surprising how these wild things respond to good care, developing luxuriant foliage, larger blossoms and deeper colors.

The wild flowers may be taken up and reset at any time with reasonable success, if one is careful to get the roots and to protect them from drying. Then it is best to cut the tops to prevent too great a loss of moisture. Some of the plants will prove to be annuals and new plants may have to be gathered or seed gathered and sown. Others are biennial or perennial and will come each season from the roots or will reseed themselves. There is no danger of crowding; the law of the wild, the survival of the fittest, will take care of that, if the gardener's trowel does not accomplish the thinning; and, since the work of the garden is half the fun, the digging and thinning and weeding and transplanting, that is likely to be done. If the effect of color or size combination is not all that is desired this year, it can so easily be changed for next season, and with each change comes fresh interest in the garden.

Now add to that the interest in the wild things that one gains with the trips a-field, the pleasure of the hunt for new plants, and the joy of discovering, what more can one ask of the garden?

Flowers may be grouped according to size or color if one wishes. Tall growing plants may be at the back or may stand out to emphasize some

feature. Small plants may be bedded in masses or may nestle under the taller ones, making a fringe about their feet. If by reason of one's enthusiasm the border becomes so deep that all parts cannot be reached easily from the grass plot, stepping stones may be laid to suit the convenience of the gardener.

GARDEN WALKS[1]

By HUGH FINDLAY
Professor of Agriculture, Columbia University

It is hardly possible to have a garden without paths which tie the garden to the house. They may lead us to the friendly doors of the dwelling, but they may also guide us through a thousand wonders to a sheltered nook where a bower of sweet-scented honeysuckle or old-fashioned roses awaits our coming. Sometimes the intimacy of well-constructed and appropriate garden walks will stimulate a genuine desire for gardening as well as a personal interest in the individual blooms as they appear in their season.

There are, of course, many types of paths to choose from, and while the individual likes should be satisfied, yet there are a number of factors to consider before deciding on the type of path best suited to your plan and grounds. To a certain degree, in the construction of paths one must be guided by the type of house and the form and type of the garden. For example, the rustic-looking flagstone paths look well near the old Tudor or Elizabethan types of houses. Rough brick paths may also be constructed from the sidewalk to the decorative doorway of the Colonial house, but brick as a rule is not so attractive as other types of walks on account of the bright color.

There are certain surroundings in which the Colonial house should have an old-fashioned garden of perennials along dirt or gravel paths. Leading from a bungalow or cabin, a dirt path or one of natural flat stones fitted tightly in the surface soil is most desirable. The little cottage, if partly brick, might well have brick walks. There are many types of cottages that look well with gravel paths leading from the sidewalk or road and also through the garden. When we go into the rose garden, there is nothing more attractive than little paths of grass between the rose beds.

No matter what type or style of path you select, the subject of proper drainage is most important. This essential feature of a good path and the

[1] Adapted from *Garden Making and Keeping* (Garden City, N. Y.: Doubleday, Page & Co. [now Doubleday, Doran & Co., Inc.], 1926), pp. 25–30.

principles involved remain substantially the same whether the path be constructed of concrete, brick, slabs, gravel, or other material. The shape and slope of the path are the first consideration, especially of a gravel or dirt path. These types should always be "crowned" or rounded up toward the center so that there may be a fall from the center to the sides. The crown may be slight, but at any rate the water should flow freely toward the gutters. Concrete and brick paths may be practically level, with gutters on one side at least to carry off the rain water.

If the path is steep, it should be supplied with substantial gutters on both sides. It is no easy matter to construct gutters satisfactorily without making them too stiff. If bricks are used the edge of the gutter may be left uneven by leaving out half a brick here and there and then fitting tiny plants into these spaces. If the surface of the brick is rough it will soon become covered with moss, especially in the shaded places, and this will take away the newness—which is always objectionable. If cobbles or flat stones are used the edges should also be unevenly connected with the path and lawn or road beyond so that the monotony may be eliminated by fitting plants along the edge. This planting along the gutters must never be of such a nature that it interferes with the proper drainage.

The dirt or grass paths may be drained by allowing spaces of from two to four inches wide and from two to three inches deep along the edge. No material of any kind is used to construct these edges, but just the dirt furrow is kept shapely. This of course applies where there is only a slight slope; if the path is steep, one must build a permanent and secure gutter of some rough material.

Cement paths are rarely recommended for the garden. They may be constructed as a wide walk to the entrance of the lawn or garden, but it is pleasant to step from the concrete to a different type of walk to the house.

In constructing grass paths between rose beds, it is not uncommon to lay sod and pack it down firmly so that the roots come into direct contact with the fine, rich loose soil on which it is placed. Scatter over the surface of the sod a sprinkling of fine soil and spread this out with the back of the rake so as to fill in any spaces. Then sprinkle over the soil and sod a mixture of lawn grass seed, and finally roll the sod. All of this should be done in the spring. The first fall scatter over the grass a coating of very well-rotted manure in which the weed seeds have been destroyed. The following spring rake off what remains of the litter and again roll. This treatment will make excellent grass paths.

If a gravel path is to be constructed, first dig out the path to a depth

of twelve inches. Place six inches of coarse stone on the bottom and four inches of broken stone on top. Above these layers of stone place two inches of finely chipped stone. After the fine stone is spread evenly over the surface of the walk, saturate it with water and pack it down with a heavy roller. This deep foundation of rock will insure proper drainage and will, to a large degree, prevent the washing off of the fine surface material.

It is seldom that any planting is done close to the edge of gravel paths. If flower borders are to be constructed along the path, there is a strip of sod from twelve to eighteen inches wide laid between the walk and the planting space. It requires attention to keep the weeds out of a gravel path; a sprinkling of coarse salt is a sure death to them, and a spray of solvay calcium chloride will not only keep down the dust but will prevent weeds.

Brick paths need good drainage of from six to eight inches of stone or of cinders and about two inches of coarse sand. The foundation material should be packed down thoroughly with a heavy tamper or roller before the bricks are laid. If at uneven intervals part or all of a brick is left out near the edge or side of the path, this space may be used for planting. Take out all the rough foundation material below this space and then fill in with a rich soil made up of leaf mold, decayed sod, and a little very well-rotted cow manure mixed with the garden loam.

On setting out the rock plants do not ball or crowd the roots, but place them on a downward slant and firm the soil tightly about them. Care should be taken not to bury the heart of the plant too deeply. The soil in these pockets will settle, and a top dressing of compact soil should be applied in the fall or during the growing season.

If after the lawn is well established you wish to construct a stepping-stone path, place the slabs of stone in position on the surface of the lawn. After you are fully decided as to the width and position of the path, cut out the sod along the margin of the slab and remove the sod. Fit the slab into this space. This practice is most satisfactory because the stone slabs fit snugly to the grass. The slabs of stone should be a little below the surface of the sod so as not to interfere with the mowing machine. If the soil is at all marshy, from five to six inches of cinders should be fitted beneath the stone slabs.

Where a series of slabs of sand or limestone is used in making a walk, do not dress the broken corners. When possible secure stones that show the sign of age and fit them unevenly rather than formally along the walk, leaving a space of about two inches between stones. Proper drain-

FIG. 66.—The home of an architect, Mr. Walter Erkes. Garden walks are made from various materials; flagstones are appropriate here. (Photograph by Padilla Studios. Courtesy of Palos Verdes Homes Association, Calif.)

age should be emphasized and may be had by following the suggestions given for the construction of a foundation for brick paths. After the stones are placed, clay, sand, or ashes should be packed tightly along the edges of each stone. If the path is well drained and packed there is little danger of the stone heaving as the frost comes out of the ground in the spring. Between the slabs of stone where rock plants are to be placed, build pockets filled with rich soil to a depth of from six to twelve inches.

Keep in mind that these slabs get very hot during the summer and absorb a large amount of water. If watering is necessary, spray the plants slowly and gently with a fine spray during the early part of the evening and see to it that the soil is moist down to the bottom of the pocket. Never water during the heat of the day.

A slight stirring of the soil to a depth of about one inch, now and then, for a week or two after the plants are set out, or just before watering, is highly recommended. By letting the air into the soil the growth of moss is prevented and the development of acid checked. This air drainage through cultivation not only liberates plant food and allows the moisture to work into the soil, but it liberates also the carbon dioxide which is so much needed by the plant. This gas comes from the breaking down of organic matter in the soil each time the soil is cultivated.

While we want our paths artistic we must never lose sight of the fact that, after all, they are utilitarian. They should be dry and conveniently arranged. Our planting must not interfere with the usefulness of the path. They should open up a way to serve a real purpose rather than merely look beautiful.

VEGETABLE GARDENS

The vegetable garden should be located whenever possible on land upon which the sun shines at least five hours daily, where there is plenty of moisture, and on soil which is free from rocks beneath the surface. Vegetables should not be planted near large trees or on low land where crops may be washed away. However, in the small grounds there is little choice of location. The garden should be so arranged that tall growing plants will not shade smaller ones. Since the location of the garden, preparation of soil, seeds, planting, and specific crops are discussed by W. R. Beattie in the United States Department of Agriculture bulletin, *The City Home Garden*,[1] the subject will not be discussed in this chapter.

[1] To be obtained from the Government Printing Office, Washington, D.C.

SUMMARY

Landscape architecture is an art of design—the arrangement of buildings, drives, walks, gardens, lawns, and planting in the landscape. The house plan should be considered, whenever possible, with reference to the plan of the grounds. In the small grounds planning for space is a chief consideration, and it is well to keep in mind that too little is better than too much. A small place cannot be a large estate in miniature. Narrow beds and paths and diminutive detail should be avoided in small grounds. Straight lines emphasize long dimensions.

Direct access from the living area of the house to the lawn and garden is advisable. The smaller the lot the higher must be the boundary hedge to secure seclusion and the narrower it must be to save space. The presentation of the garden from the house should be a general not a detailed picture, and unsymmetrical arrangements in small grounds are preferable. Such service features as delivery and work yard and clothes-drying yard should be hidden from general view. Roads and walks should be few and inconspicuous, and they should leave the lawn areas as unbroken as possible. A straight walk usually is advisable when the house is closer to the street than the width of its front.

Lawns should occupy as large areas unbroken by other features as the limits of the place will permit, and as much as practicable of the area between the house and street should be in turf to form the foreground of the picture. The line of the rear lawn should be parallel to the property line, and the major part of the rear yard should be kept open. Although it is desirable to have all possible lawn area in the rear in general view, best results are obtained by having some features or areas wholly or partially hidden. The foundation for a good lawn is rich, deep, well-drained soil, retentive of moisture. The grass to be used depends upon the section of the country.

Trees should be located to frame the house with the space at the middle in the front of the house left open. In selecting trees consider exposure, ultimate size, rapidity of growth, length of life, adaptability to the soil, and general landscape effect, freedom from disease and insect pests, long-lived and tough species that will not break or drop branches in a high wind. Shrubs should be planted against the foundations of the house, at corners, and in angles including angles of steps, porches, and at intermediate points of long straight sides, in clumps along boundaries, and at junctions of walks and drives. Clumps of shrubs used in small grounds should not be uniform in size, height, or breadth, or composed of the same

kinds of plants. Vines may be used on fences, arbors, or trellises, against the buildings, or on porches.

Herbaceous perennials may be used in the edges of the shrubbery groups or in special borders. Annuals may be used in small clumps in the edges of shrubbery, in the flower garden, or to supplement perennials in borders. Flower gardens are preferably placed on the sides of the house adjoining the living room if the width of the lot permits, otherwise at the rear or as a border on the side of the lawn. Too many flowers are undesirable. It is advisable to keep the front lawn unbroken.

In foundation planting, the most important locations for plant groups are the prominent points—the front corners of the house, or porch, a large wall unbroken by windows. Plants should not be placed under window sills that grow higher than the window or along a porch that will exceed a height of thirty inches above the porch floor, if it is desirable to maintain a view. It is advisable in foundation planting to use plants varying in height to keep the top line irregular. A row of plants of one kind along a porch wall is inappropriate. Continuous planting along a foundation wall also is undesirable as best results are obtained when some of the foundation wall is in view. Variety may be obtained by using plants of different forms of growth and various sizes and colors of leaves—spreading, drooping, large and small leaves, leaves of various shapes and color.

Too great variety of plants for the small grounds is not in good taste, and one type of plant or foliage should predominate. Also, plants should be selected that are known to thrive in the locality.

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[NOTE.—Information on plants and planting usually may be obtained upon request from the State Colleges of Agriculture.]

[1] All obtainable from the Government Printing Office, Washington, D.C.

CHAPTER XVII

RURAL HOMES

A home planned for the city dweller rarely meets the requirements and needs of the farm family, but with the development of electrification programs, and electric light and power pushing their way into more and more farm territory, with improved heating systems, with provisions for water supply and circulation adapted to farmhouse needs, satisfactory sewage disposal, mechanical refrigeration, and other conveniences, the similarity between urban and rural dwellings becomes greater and greater. It is even more difficult, however, to set standards for farmhouse plans than for those of the city dwelling, owing to the fact that each type of farming has its influence on the activities carried on in the home, thus necessitating a plan suited to the many operations. Space and equipment for the feeding of "crews" essential for some types of farming is unnecessary for others. Rooms and conveniences for "hired" men, provisions for the storage of large quantities of vegetables, fruits, and other supplies obviously will vary not only with the type of farming—dairy, grain, fruits, poultry, and so on—but with nearness to urban centers, transportation facilities, the family makeup and habits, and other factors. Both farm and urban homes should be planned and equipped for the needs and activities of the families who will occupy them, but the farmhouse, in addition, may require planning and equipment for many additional operations and activities.

It may be due to the varying needs of the farm family that so few stock plans have been prepared for farmhouses. The Division of Agricultural Engineering of the United States Department of Agriculture has a small number for distribution, and some of the state colleges of agriculture have prepared a few plans for the benefit of the farm families of their own states. Stock plans are published also in some of the farm magazines from time to time. There is, however, a need for better domestic architecture in rural communities, for few farm families can afford, or do afford, the services of architects, particularly good ones. Educational campaigns such as those of Better Homes in America and its Better Homes schools, the work of state colleges and state and county home-demonstration agents, have carried on extensive home-improvement campaigns. These improvements

have raised the standards of living among small-income families in rural sections and demonstrated good architectural design. Such campaigns and demonstrations have their educational value, and even in the most remote rural areas architectural design appears to be reaching a higher standard.

The articles in this chapter, therefore, will emphasize only general requirements and provisions for farmhouses. The number of living-condition studies which have been made in many sections of the country show home-improvement needs and the amount of equipment and labor-saving devices in use. A number of these studies are listed in the references following the chapter. Since virtually every state agricultural college and the United States Department of Agriculture distribute invaluable information prepared by specialists on heating systems for farmhomes, various methods of providing the home with water, including many low-cost systems and sewage-disposal methods with carefully prepared directions for the making of septic tanks, such equipment will not be discussed as bulletins may be obtained.

Many families, however, will not be provided with mechanical equipment, conveniences, and labor-saving devices for years to come, therefore books and bulletins describing inexpensively-made and installed equipment are included among the references on page 577.

THE DEVELOPMENT OF BETTER FARM HOMES[1]

By DR. LOUISE STANLEY

Chief, Bureau of Home Economics, U.S. Department of Agriculture

. . . . Improved methods of farming mean that fewer people are being needed to carry on the work of the farm, ...

In the second place, we know that the returns from farming are being used to an increasing extent to support urban homes. In some cases the family may live for only a portion of the year in the city, but some of the large western farms have really come to be business enterprises supporting urban homes. This is interesting because it is such a reversal of the picture we used to have, particularly in the South where urban business was used to support the rural home. The man of business took his family out to the country to live because of the advantages and joys of living in the open country.

[1] Adapted from "The Development of Better Farm Homes," *Agricultural Engineering*, April, 1926. (Address, National Farm Homes Conference sponsored by the American Society of Agricultural Engineers, Chicago, February 18 and 19, 1926.)

In the third place, there is the health situation. Various rural studies tend to show that in spite of the abundance of fresh air and sunshine in the country the rural child is not developing on a par physically with the city child. The difficulty, where this is true, lies primarily in the home and the community agencies closely associated with it.

These are the facts: The proportion of rural to urban population is decreasing. The urban home is attracting even those engaged in agriculture. Seemingly the rural child, contrary to the earlier situation, is below the urban child in physical development, and even mentally does not seem to show the same development. This is the most alarming part of the picture for, after all, the most important contribution of the country home to the nation has been the country child.

In any program for the development of the rural home, we need first to find out, if we can, the causes of the present situation. An important factor has been the economic condition of the agricultural industry. Many have left the farms discouraged. Home conditions have been at the root of this discouragement in many cases.

Also, as agriculture has come to be more specialized there has tended to be too complete a separation between the farm and the farm business. . . . . While the frontier farm was self-supporting, the returns came largely in terms of family living; now we think in terms of a cash crop which has to be exchanged for family living. In the enthusiasm for developing the business, the farmer is likely to lose sight of the end, a satisfying home life, in his interest in the means to that end, farming. There is a tendency "to produce more corn, to feed more pigs, to buy more land," in an endless circle, and in this circle the home for which it is all maintained is lost from sight. This situation has made an economic adjustment in this period of low prices for farm produce more difficult. The spread between what the farmer gets now and has been getting for the last two or three years for his product, and what he must pay for necessities, has been too great. Agricultural economists have told the farmer that the solution for his problem is to produce a larger amount of what the family needs. That this can be done has been shown by studies made in the Department of Agriculture and in the states. It has been made more difficult, by the very complete separation of the farm business from the family living.

Probably second in importance have been the long hours of household work. There is more work to be done, the rural family is larger, the hired help must be fed in many cases, and at times this means much extra work, and in addition, the woman helps with the milk, the chickens, and some-

times with the garden. Fewer conveniences, water in the house, electricity and gas, are lacking in the larger percentage of the country homes. Houses are planned without much thought of the work which must be done in them. Domestic service is not available, even if the price could be paid. Outside agencies to take over some of the home tasks are not accessible. The laundry, the corner bakery, the commercial ice cream maker, are just commencing to reach out to the country home.

In the third place, the absence of community social agencies, which supplement home life, discourage many. Poor schools, absence of church associations, lack of facilities for wholesome recreation, libraries, and health agencies, all these have an important bearing on the development of the rural child, as well as the satisfaction rural life offers to the family as a whole. These can be provided and are being provided in the more forward-looking communities. The conditions under which these can be extended need to be studied.

We have tended to measure the returns from country life in terms of urban standards and ideals, and false values have been attached to these, rather than stressing the real values of country living. The late Secretary Wallace expressed this in the statement, "Too many people assume that urbanization and civilization are the same." That there is a real appreciation of the values of country life by the women themselves was brought out by comments sent in by homemakers contributing to a time study undertaken by the University of Missouri. One housewife said that though the hours are longer, they are made up for by the greater satisfaction. Besides being more free than the city woman to set her own standard of living, the rural homemaker has another important advantage. In the summertime at least, she is out-of-doors a great deal. We sometimes fail to estimate the value of outdoor life to the health of the individual. An urban housewife reported that she had all labor-saving devices and conveniences but that she was mostly fatigued from too much indoor life and too many scattered interests. She compared her present situation with the situation in which she lived previously, when she kept house in a sod house with no labor-saving devices. In addition to her housework she gardened, made butter, helped with the milking and other farm chores. Yet, under these conditions, with her simple standards of living, she enjoyed the best of health from out-of-door life and no hurry or worry.

Practically, the domination of urban standards has made it more difficult for the rural homemaker to obtain house designs and furnishings

adapted to her needs. The largest buying power has been concentrated in the city, and urban needs have set the standard for things that are produced. They dominate rural architecture, house plans, equipment and furnishings. Examples of this are seen in every rural community. Not only are the exterior designs planned obviously for urban conditions, but certain requirements such as a side entrance, a washroom for the men, and a laundry on the same level as the kitchen are lacking.

Now what is our program for the development of the rural home? I am putting first, better thought-out farm plans. I think in too many cases we have not thought out the whole farm plan before locating the house. Taking into consideration the fact that agriculture is a method of living as well as a business, a plan that makes the most of the natural beauty and contributes most to the aesthetic as well as the physical development of the family.

In the second place (and that is the job we should turn over to the American Institute of Architects), we want to develop a type of rural architecture which is suited to rural surroundings and needs, not one that is copied from city dwellings but one which expresses the spirit of the open country and takes advantages of its opportunities. This is not going to be one for the country as a whole because our country is too varied to have any one type of architecture to express the spirit of it in all the different sections. These plans should provide for convenience where convenience is most needed, attractive surroundings, and furnish a background for the development of wholesome family life.

Attention must be paid to planning for comfort and health, as well as convenience. Sunlight, the prevailing breezes, adequate ventilation, water supply in the house, waste disposal and central heating are all factors which contribute to these. Add to these well-balanced food, simply but tastefully prepared, and you have the foundation for family health.

In the next place we want better labor-saving equipment for the home, and if there is any one place where we need to work together, I think it is here. We need first (and this must be the home economics contribution) to know what equipment is going to help the homemaker most. Time studies will show us this. It will be determined not only by the amount of time and labor saved but also by the amount and cost of available labor. Efficiently arranged kitchens and labor-saving devices are more usual in California, partly as the result of the labor situation, and these have developed slowly in the South where domestic labor has been more abun-

dant. Washing machines are more generally used than dish washers. The greater number and efficiency of the washing machines as compared with the dish washer are factors in this, but the number of small hands in the usual household able to wash and wipe dishes but unable to do the more strenuous job of washing clothes, has probably been a contributing factor.

Comparative studies of different types of equipment must be made by the equipment people themselves, since they cannot be made by government or state institutions. There is nowhere that the housewife, either rural or urban, has been exploited more than in the sale of labor-saving equipment. Better business is going to stop this, and it must come from the equipment people themselves. There are too many designs. Experimenting has been done largely at the expense of the housewife, and that is the reason she is paying what she now does for such equipment. It has been costly experimenting. Now is the time for standardizing household equipment. Fewer designs are needed. They should be better, and they can be cheaper with still a fair profit. We need better trained salesmen for these devices, and that too is a question of better business. We need better servicing for them, because they are not going to take the place they should in the home unless they are better serviced, and only a few of the equipment people are recognizing as they should this servicing need and providing for it.

We are going to pay more attention to the beauty of these homes. While this will develop more slowly perhaps than convenience and health factors, it is going to be looked upon as quite as important.

THE LOCATION OF THE FARM HOME

There are fewer restrictions in locating the farmhouse on its site than there are in the placement of the urban dwelling on its usually small city lot. The farmhouse site in nearly all instances provides opportunities for suitable placement for sunshine, view, and attractiveness. The selection of the site and the location of the house are ably discussed in the two United States Department of Agriculture bulletins *Planning the Farmstead*,[1] by M. C. Betts and W. R. Humphreys, and *Beautifying the Farmstead*,[2] by Furman L. Mulford. A few of the essential considerations are included in the paragraphs from the bulletins which follow. Additional

[1] Farmers' Bull. 1132, U.S. Department of Agriculture.

[2] Farmers' Bull. 1087, U.S. Department of Agriculture.

information with diagrams and illustrations may be obtained from these two publications. The following paragraphs from *Planning the Farmstead* contain a brief discussion of the factors which usually govern the location of the farmhouse.

"The planning of a farmstead layout involves the arrangement of the various buildings, yards, lots, etc., with relation each to the other, to the fields and to the highway, in such manner that there shall be a minimum of time consumed, no retracing of steps, and no lost motion in executing the routine work of the farm. It includes the designing of each building or other unit for the particular purpose for which it is intended, and its location with reference to its functional relation to other units. It means the creation of a practical business establishment in combination with a home which must be attractive and inspiring to its occupants if the best is to be had out of farm life.

". . . . Pleasing architectural effects, tempered with economy in materials and construction, should be sought in the designing of the buildings, such as barns, stables, and the smaller structures, but the first consideration is that of utility.

"The farmhouse is another problem. Here utility, while of prime importance, is not or should not be the only determining factor. The amount of money invested in a house should be such that the net income of the farm can easily take care of the interest, if interest must be paid, without too great restriction upon other expenses. Within this limit, the farm home should have all the conveniences and comforts possible, and should be as attractive in design and surroundings as it can be made.

"Where ample capital is available, all permanent buildings and equipment as a sound business proposition should be of the best materials and of substantial construction. The farmhouse, however, should be more than well built; it should provide ample accommodations for those it is to shelter; it should be well lighted and warm; it should have all the conveniences and labor-saving devices possible in order that the housework be reduced to a minimum, and it should be furnished in good taste. The cost should not be viewed as a financial investment upon which the farm business must pay full interest. Money judiciously expended on the farm home earns a return that is not to be measured in cash. A sense of pride in the ownership of an attractive abode; the physical well-being of those enjoying a healthy, wholesome, and happy family life; the effect of pleasing surroundings which, though rather intangible, is reflected in the con-

tentment and loyalty of those concerned in the maintenance of the home, constitute a return which, while indeterminate, has a monetary value. A pleasant farm-home life affects the business of the farm in many ways, all tending to increase returns on the business investment.

"Careful arrangement of the farmstead and intelligent planning of the farm buildings is good business under any circumstances, but it is especially important when capital is limited and must be made to go a long way. When such is the case the farm business plant must be first considered, but the ultimate farm home should be planned for with the rest of the farmstead. Possessed of the plans for an attractive home, the farm family has something toward which to work, an incentive to thrift and economy in the operation of the farm, and a tie to farm and home life not easily broken.

"The established farmer who contemplates improving the working facilities of his farm must take conditions as they are, and remodel, tear down, or move, as may be necessary or advisable. When unimproved land is to be developed, the purchaser usually gives consideration to its suitability to the business he intends to pursue, the character of the soil, the lay of the land, the accessibility of markets for his products, etc., but a very vital consideration is frequently overlooked, namely, a suitable location for the farmstead.

"Much of the success of the farmstead plan depends upon the care expended upon selecting the location. This is not always a simple matter, because the features that influence a choice of location are numerous and often conflicting. Of the more important considerations there may be mentioned location with respect to the rest of the farm and to public utilities, elevation and drainage, water supply, nature of soil, orientation, prevailing breezes, and protection from heat and cold."

The principal considerations in locating the house are discussed by Mr. Mulford in the following paragraphs from *Beautifying the Farmstead*.

"The factors that should determine the location of buildings are (1) access to a good highway, (2) possibility of protection from objectionable winds or the utilization of desirable ones, (3) practicability of adequate drainage, (4) a sufficient supply of good water, and (5) desirability of outlook.

"The construction of hard-surface roads in the open country is making it possible to get to and from town at all times of the year. This is im-

portant for both business and pleasure. The exposure is an important consideration for securing the comfort of the family and stock. In cold countries protection from the winter winds is desirable, and the location of the most used rooms should be on the warmest side of the house, while in warm countries the house and living rooms need to be so located as to get the benefit of prevailing winds during the hottest months.

"If at all possible, the house should be so located near good trees that their shade may be used and enjoyed by the family every day during the summer. It takes so long to grow good trees that existing trees should be cherished and utilized to the fullest extent.

"The elevation should be such as to make possible thorough drainage, even though it may be desirable to keep off the highest ground. Under no circumstances should the house get the drainage from other buildings.

"In a hilly or mountainous country the site should provide a little level land immediately adjoining the buildings, especially the dwelling. This is necessary both for appearance and for comfort in living. Where such a setting is not provided the house is likely to give the impression of being about to slide from its location, while with a little level ground close by, it may give the appearance of fitting closely into the site. In the case of a side hill or bank house it may be necessary to build with one side facing on a higher level than the other. If the level areas are of reasonable extent, although at different heights and separated from each other, the desired impression may still be given.

"The rooms used most should be given the benefit of the best views; those from the kitchen as well as from the living room should be attractive. The near view should be over an unbroken lawn, and there should be some object of interest beyond. If there are no such objects in the general landscape, such as a mountain, a water view, a woodland, a meadow, or an extended farm view, a handsome tree or other bit of near-by landscape may be available. Lacking these possibly some feature may be created on the place, such as an attractive group of shrubs, well placed and arranged so as to have something of interest each month.

"The area that should be set aside for the house lot is dependent on many factors. The larger and more pretentious the house the more land should appear to be with it. Though it may be necessary to have a lawn that is small, it is frequently possible to increase the apparent size by making adjacent areas appear to belong with it. If the apparent size can not be increased, ... it should be at least possible to prevent the dwarfing of the appearance by growing only low crops in the near-by fields,

keeping tall crops and orchards at a little distance. Where this is impracticable the area of the home lot should be doubled or trebled.

"The barns should be properly arranged to facilitate the farm work and be accessible to the road, but they must also be reasonably convenient to the house without being too close, prominent, or obtrusive. They should be so situated with respect to the house that the prevailing winds, especially during those seasons when the doors and windows are likely to be open, do not blow from the barns toward the house. On the other hand, in cold climates the barn as well as the house needs protection from severe winter winds.

"Further, the buildings must be arranged for convenience. The interior of the house and its connection with the outside features, whether the barns or the public road, should be adapted to the everyday life of the family. All too common examples of inappropriate farm architecture are front doors that are never used except for funerals, and parlors that are so seldom used that when they are they cast a reserve over the whole family. Drives and walks to such front doors are a meaningless formality and should be eliminated. In a house of such design the neighbors usually go directly to the kitchen, because they know that is the entrance the family uses, and the life of the family is so far from the front door that it is impossible to get any response even if the attempt is made. A more pleasing and satisfactory arrangement is to have the entrance open directly on the part of the house the family uses.

"The entrance should be so located as to be easy and natural for both family and visitors to use. The approaches to it should be so direct that there is no feeling of being taken out of the way in following the roads or walks provided. In such an arrangement the entrance and approaches are naturally used in accordance with their design.

"The barns should be at a little distance from the house, but close enough to facilitate the work to be done, and of such a character architecturally that they look as though they belonged together. The buildings should be as few in number as is practicable, or at least should have the appearance of being a unified group from the principal viewpoints. Such results can be brought about by careful grouping, sometimes even building them around a courtyard, or if necessary connecting some of them by sheds or walls. The objection to close grouping is the danger from fire, but facility in doing the work may be an offset to this. A number of small unrelated buildings gives a 'cluttered up' appearance."

PLANNING THE FARMHOUSE

The article which follows by Mr. Wichers, although particularly applicable to farmhouses in Kansas, contains many suggestions applying in general to farmhouse problems. Grazing, wheat and corn growing, diversified farming, dairying, truck farming, and poultry farming require a variety of farmhouse plans. Also there are no two farms or farm families with identical requirements. Mr. Wichers states in regard to the planning for the many types of farming: "Such variety immediately makes clear to anyone at all acquainted with small-home architecture that a wide range of farm-home designs is necessary to solve so many problems. There can be no farmhouse that will suit all men who raise only wheat or who raise only chickens or who do diversified farming. How utterly impossible it is to make a standard house fit such a variety of interests as is possible on the farm!"

CONSIDERATIONS IN FARMHOUSE PLANNING[1]

By H. E. WICHERS
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Fundamentally all homes are intended for the same purpose—shelter. The hotel, the apartment house, the city home, the country estate, the palace and the shack all are forms of shelter. They are not commonly referred to as shelters because the word has come to mean only the barest necessity, the crudest of conceptions. So other words are used to express our meaning. The word "hotel" means a specific type of human abode and "palace" something decidedly different. Each of these words means shelter-plus. Plus the niceties and amenities of life. Plus the equipment and convenience. Plus the beauty and harmony of worth-while existence.

The different names refer to different types of abode for man, and each type fills a particular need. In order to do so it must be especially designed and equipped. A palace that would be suitable for an exacting king would be a poor hotel. In the same way an excellent city house likely would be unsuitable for a farm home. In either case, however, the elements of both would be similar. Living quarters, sleeping quarters, and service quarters would be necessary and fundamental, but in the location of these elements and in the details one would find sharp contrasts. It is the variation in these details that makes the house conform to special needs, and serve for special occasions, and special uses.

[1] Adapted from *Designs for Kansas Farm Homes* (Kansas State Agricultural College, 1929), pp. 16–19.

In the city a great number of conveniences are provided by the community. Even in many of our small towns running water, electric lights and power, and sewage disposal are provided by community effort. In some, gas for cooking and even for heating are added to the list. There is no need to carry large stocks of groceries or supplies on hand. Almost anything can be secured on short notice. Hospitals are at hand for the sick, and hotels for social occasions. On the farm, as yet, each home-owner must provide them for himself.

Due to a lack of suggestive farmhouse plans the farmer who wished to build has usually turned to the great variety of available city house plans for suggestions and has often ended by building a city type of house on the farm. There are cases, of course, where the plan was wisely selected and a suitable and well-appointed house built. For the most part, however, this practice has resulted in failure because the average house that is well adapted to city living is wholly inadequate for farm life and its problems The author has examined a large number of city house plans in the hope of finding some that would be of value to the farmer and has found only a few that could be used. Even these, if they were to be at all available, had to be partly redesigned.

The city house and the farmhouse have many things in common which must yet be handled differently. Each has a kitchen, but in many instances the city kitchen can be placed in a very secondary position because it may be used but a few hours each day. At present the farm kitchen is in almost constant use, because the farmer's wife is called upon to do a large number of things that the city wife doesn't even think of doing. The farmer's wife is in most cases the assistant general manager of the farm and not infrequently the manager. For a large part of the day she is in charge of the farmstead proper. This being true, the kitchen in which she spends much of her time should have a full view of the other farm buildings, and, if possible, a view of the highway. This factor in particular is likely to present difficulties for the designer. For each of the four main frontages; namely, north, east, south, and west, the location of the kitchen is limited. It can be moved but very little. In the case of the farmhouse north of the highway the best possible location for the kitchen would be on the northeast corner of the plan, where it commands the road and approaches to the house and a full view of all of the farm buildings. . . . .

A problem in farm-home planning that is seldom met in city home planning is that of the washroom. This room should be accessible from the side of the house that faces the other farm buildings and from a hall

that leads directly to the dining room. This is a very important part of farm-home planning, and especially so if there are times during the year when a group of farm hands must be fed at the farmhouse. These farm hands should not even pass through the kitchen, and most certainly should not be required to wash in the kitchen. The author is aware that more and more such temporary labor crews feed and house themselves, but there are still parts of this state where the farmer's wife is required to cook for and even to house from two to twenty helpers at certain times of the year.

In the city or town one finds very few of the new small-home plans that have any place provided for the storage of quantities of food supplies. The city housewife knows that she can replenish her supply within a few moments, and since this is true, why bother with a large supply? True, the farmer is much closer to a base of supplies than he used to be, because of the automobile, but the larder is not quite so easy to refill and he must therefore carry on hand a larger stock of edibles. Besides, on most farms there is need to store quantities of garden products. These together with the groceries must have good and easily accessible storage, accessible not only from the kitchen but from the outside.

In the case of the city house of small size, one often finds the main stairway leading up from the front hall. This practice is often questionable even in the suburban house, and it will rarely work to advantage in the farmhouse unless the main entrance is placed adjacent to and with direct access to the kitchen. If the kitchen and the living room are both near the front door there will seldom be a time when the housewife will have to walk more than a few steps to answer the doorbell. All things should be planned to save labor, and it is high time that the stairway be located where it is easily accessible to those who make the most use of it. In the average farm home these are most certainly not the guests, but the members of the household and especially the housewife.

Probably the chief difference between the farmhouse and the city house is that the farmhouse is more of an independent unit. It must be more self-sufficient, while the city house depends upon its close relationship with its host of neighbors who work with it in obtaining many kinds of service which the farmhouse must contain within itself. Again the city house is in most cases not even remotely connected with the owner's business, while the farmer carries on a good share of his business from an office in his house. Whether this is good practice is open to question, but there are many reasons in favor of it, especially on the smaller farm.

Generally, the farm home must be larger than the city home. However, with comparatively cheap land value, there is not so much reason for the farmhouse to be compact. Take advantage of this freedom. . . . . With less limitation there is a better opportunity to arrange the various rooms so they will function properly. On the other hand, it is difficult to heat a house that is too rambling, and compact houses are likely to be somewhat less expensive to build.

It is as impossible to design the ideal farmhouse as it is to design the ideal city house. There are no two farms with exactly the same conditions. There are, however, certain groups that have much the same fundamental problems. . . . .

Ordinarily the first- and second-floor plans are fully determined as to outline and size before the basement is given serious thought. One reason for this is that few people build partitions in the modern basement save for a fuel room and possibly for a fruit room. Of course more rooms are possible, but the question arises: Will the space be more usable without partitions or with them? Certainly it costs less to leave out the partitions. Seldom is basement space usable for bedrooms because of the dampness. Even for an office its use is questionable. In other words, basement space is usable only for those things that slight dampness will not harm.

Shower rooms, work rooms, and laundries are found in the basement, together with space for storing some kinds of vegetables and certain equipment. Very often pumps for water-pressure systems are located in the basement. In such a place they are accessible and are not likely to be harmed by frost. One must remember, though, that pumps are noisy even if electrically operated. The continual starting and stopping of an automatic pump is disagreeable to some people. One can be rid of this noise by placing the pump in a pit located at a short distance from the house.

Keep in mind that ash dumps under fireplaces and all flues should have "cleanouts" in the basement. Floor drains are worth many times their cost. Electric-light outlets should be considered early when planning. They are easy to install at building time. A hot-air furnace is a cumbersome thing, even if it is comparatively efficient. It will occupy more space than those accustomed to a stove or a steam furnace will suspect.

The basement should be well lighted. Make the windows as large and as numerous as is reasonably possible. The basement is likely to be a bit damp in any event, and dark basements are not half as usable as those that are light and well ventilated. Whitewashing the walls will better the

appearance and help rid the place of the mustiness that the very word basement implies.[1]

From the viewpoint of the designer the farmhouse problem is a special problem. There is wider choice in style and design possible for its exterior because there are fewer conflicting elements to harmonize before the type and style are determined. The plot is not so limited. There are no close neighbors whose houses must be considered. There are only the site and the other farm buildings to harmonize with it in order to accomplish the result desired, and these are all under the control of one individual.

CONSIDERATIONS IN THE CONSTRUCTION OF THE RURAL HOME[2]

By JAMES S. TAYLOR
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It has become common in construction, as well as in other fields, to define the standards of performance expected of the finished product.

What is it that we expect from the structure of a house? In the first place we must have stability in the foundation and in the structure. Cracks in the woodwork and plaster, doors that stick and jam, and openings that let in rain and snow, are the inevitable consequences if the foundations settle and crack, or if the walls or framework become distorted. Adequate protection from wind, rain, and snow is essential. Nothing adds so much to the expense of keeping up a house or makes it run down so fast as chronic leakage, and for this reason, the roof, wall surfaces, and danger points, such as flashing and window openings, should be water-tight. A dry cellar and reasonable insulation against heat and cold are also expected of a modern house.

Sufficient protection against fire and lighting is desired by every prudent owner.

Durability and economy in maintenance should be considered when a house is built. They depend largely on factors already mentioned but also involve the use of proper materials and workmanship at other points.

Good appearance outside and inside is rightly emphasized as another quality for a satisfactory structure, and it is unnecessary to dilate on the fact that it depends on good proportion, adaptation of the house to its

[1] For first and second floor planning see *Designs for Kansas Farm Homes.*

[2] Adapted from *The House We Build* (address before the Eastern States Extension Conference, Washington, D.C., February 27, 1929). U.S. Department of Agriculture Extension Service Circ. 99.

setting, and good taste in combining the various elements of the house, rather than upon expenditure for costly knickknacks.

Sanitation and health are fundamental, and we want a house that is easy to keep clean and which is so well built that rats and vermin cannot readily get into it or become easily established. The structure should be adapted, wherever possible, to convenience in housekeeping and to the installation of mechanical equipment to lighten housework.

Finally, the home-owner has to keep an eye constantly on his pocketbook while he plans. Economy in first cost and in operation after the house is built is essential.

The resources of no two rural home builders are alike. There are families to-day who are like their pioneer ancestors in that they must depend mainly on their own resourcefulness and ability to do hard work, using whatever raw materials are available, with the minimum of purchases from outside, such as window sash and a few iron and steel products. Others are able, for one reason or another, to afford up-to-date structures that embody all the worth-while features that present-day industry provides.

In a consideration of the resources of rural home builders, however, some general comparisons may be made with those of the city home builder. We may recall the old-fashioned house raisings wherein the spirit of coöperation and friendliness which has so permeated our rural life in America was revealed at its best during generations. I believe it is safe to say that this underlying spirit is still strong enough so that a family established in any rural community in America can count on obtaining much sound and helpful advice on building. The friendly counsel of an observant man or woman who has made a specialty or hobby of building can be invaluable, although it must be admitted that much of the free advice offered to a home builder may be not only worthless but a liability if it is followed.

Nearly every home builder finds it hard to get a house of the size and kind he wants at a cost which is within his reach. For the rural builder manufactured materials come relatively higher and labor relatively cheaper than for the city builder. Higher transportation charges usually add to the price of articles purchased in the country, while the owner's own labor and lower wage scale make the addition of a greater amount of labor less burdensome financially than in the city. Hence a higher-priced material, which saves labor on the job, may be profitably used in the city but not necessarily in the country. All owners must decide whether they want

a small structure of high quality, well equipped with conveniences, or a larger structure of a less expensive type. The cost per room of two houses of approximately the same size in the same locality, for example, may vary from $600 or $800 to $2,500 or $3,000.

BUILDING CODES

The city builder is often saved, willy-nilly, from making certain mistakes because his building has to meet certain building-code requirements. On the other hand, these same building-code requirements may, because they are obsolete or poorly framed, involve him in extra expense. In many cities, for example, the plumbing soil stack must be four inches in diameter, in spite of the fact that three inches has been found satisfactory in practice for small dwellings, and has been found, on the basis of experiments at the Bureau of Standards, to be more satisfactory from a sanitary point of view. Needless to say, the three-inch stack is not only cheaper in first cost, but is much less expensive to install since it fits much more readily into walls or partitions of customary dimensions.

MATERIALS

The country builder may, theoretically, have a wider range of choice of materials than the city builder. He may be able to use posts or hewn timbers from his own woodlot, stone from his own fields, or sand and gravel for concrete from his own deposits. Yet he can purchase also basic and special materials from a local dealer or from a mail-order concern. As I have already indicated, however, financial limitations may severely restrict his purchases.

SETTING OF THE HOUSE

The country home builder has more space, light, and air, and as a corollary to this is usually farther away from his neighbors than his city cousin.

AVAILABILITY OF EXPERT KNOWLEDGE

The city builder can more easily call upon builders who have had experience in building houses of the same type, but, as I have already suggested, the country builder may be able to obtain more helpful advice from his relatives and neighbors—a process made easier by the advent of the motor car and improved road.

ACCESSIBILITY OF PRINTED MATERIAL

The city builder has readier access to public libraries, but I believe that the country builder can readily obtain such pamphlets as he may require in connection with building his home at a relatively small expense.

The modern builder to be successful must be able not only to cope with situations as they come up but must have an idea of what information can be obtained readily from printed material. He should know where and how to get what he wants without having to go through quantities of irrelevant or unauthoritative material.

FOUNDATION WALLS AND CELLAR

Good foundations, as I have already indicated, are essential for a satisfactory house. The foundation wall itself should be at least eight inches thick if of solid concrete. It should extend in depth below the frost line and have adequate footings. It is impossible to recommend a uniform width of footings because so much depends upon the bearing value of the local soil. That is one place where general rules need to be considered with relation to local conditions. In order to insure the cellar against flooding or chronic dampness it may be necessary to lay draintile outside the wall or to use a damp-proofing compound on the outside. The cellar floor itself may have to be laid on gravel or cinders, and it is well to remember that a leaking cellar is much harder and more costly to remedy after building than before. A good cellar-floor drain to carry off water which may enter, or water which may be used for cleaning, is most desirable, especially so when the floor, if it has a pitch, slopes toward the drain.

Good concrete is occasionally the product of good luck rather than good management. The careful builder will do well to consult the pamphlets of the Department of Agriculture and of the Portland Cement Association, which explain the proper mixtures, including the amount of water used—a most important factor—and means for determining whether or not the sand and gravel used contain too much silt or inorganic matter. Such precautions may take time but are well worth the assurance of a good piece of work. Furthermore, the pamphlets contain many helpful suggestions for lessening the amount of work involved. If the family cannot afford to take the precautions necessary for a good cellar and chooses not to have one it is better to rest the house on piers of adequate depth than on a shallow wall. In such a case there should be a free circulation of air under the house in order to prevent rapid decay of the

floor joists and other wood on the under surface, and heat insulation under the flooring is desirable in the climate of most parts of the country.

WALLS AND FRAMING

It may seem unnecessary to recall the fact that the walls and framework of the house should be substantial, with all the important parts well tied together. Yet, whenever a high wind comes, we learn of roofs that merely rest on the top of brick walls, without being anchored by ties to the masonry; frame houses that get out of plumb because they have not had proper diagonal bracing; and porches and ells that become detached because they are not tied to the main structure. In regions subject to high winds, frame houses without plaster to add weight are in an especially dangerous position. The Building Code Committee of the Department of Commerce recommends that all frame houses be anchored to the foundations. The too familiar sagging roof line is generally a sign of the spreading of side walls because of thrusting of the rafters, a condition which might have been taken care of by proper ties at the line where the roof meets the wall.

There are, of course, many other points involved in good framework. It is fairly common for the interior framework to be built up with a greater depth of horizontal timbers inserted between the vertical members than in the framing in the outside wall. This results in greater shrinkage, which lets down the interior partitions, and causes distortion of the whole frame and cracks in the plaster.

Diagonal sheathing is recommended as preferable to horizontal. Eight-inch brick walls should have a row of headers at least every sixth course. These and many other points are covered in the pamphlet entitled "Recommended Minimum Requirements for Small Dwelling Construction" by the Building-Code Committee of the Department of Commerce.

Possibly there are areas where ledge rock, field stones, and locally burnt brick could be used more extensively in rural construction.

ROOFING, FLASHING, AND WEATHER SURFACE OF WALLS

Needless to say, it does not pay to skimp on surfaces exposed to the weather. It does not pay, for example, to expose too much of the shingle surface to the weather. The rural builder can make his labor count to full advantage in assuring good workmanship on roofing, flashing, weather boarding, and pointing up of brick walls. Furthermore, he can see that the openings around window frames in brick walls are well caulked.

INTERIOR WALL FINISH, AND HEAT INSULATION

In this field the home builder has a wide range of choices. Assuming that there is already sheathing, good building paper tacked on to it under the weather boarding is probably the least costly step toward assuring a house that can be kept comfortably warm at reasonable expense. Weather stripping around doors and windows comes next. Insulating materials over the top floor ceiling joists or under the roof and in the walls, and storm windows may all be used to advantage, as is pointed out in Letter Circular No. 227 of the Bureau of Standards.[1] It must be remembered that it is relatively hard to add heat-insulating materials in the walls after the house is built, whereas weather stripping, or heat-insulation on the attic floor or under the roof, can be added at any time.

The interior walls may be finished with wood or metal lath and plaster, with "gypsum lath," a type of composition board which takes the place of lath and one or two coats of plaster, or with a wall board which can be left as finished at the factory, or decorated as desired; or interior walls may be ceiled with matched lumber.

PLUMBING AND BATHROOM

A great deal of poorly designed plumbing goes into houses whether in the city or in the country. The report of the Department of Commerce Subcommittee on Plumbing gives diagrams for a proper layout of the waste system for small houses, and, as you know, septic tanks and sewage disposal are the subjects of pamphlets by the Department of Agriculture and the Public Health Service.

OTHER POINTS

Pamphlets on electric wiring and fixtures are readily obtainable from dealers or manufacturers.

To continue the discussion throughout the entire house at this rate would require hours.

I can only refer in passing to the fact that the Forest Service issues booklets on the use of wood and its preservation against decay. Farmers' Bulletin 1472, entitled "Preventing Damage by Termites or White Ants," furnishes directions for protection against termites. Home-building magazines list the names of manufacturers of electrical equipment, millwork, paints, and many other materials used in dwelling construction, who furnish upon request pamphlets describing the use of their products.

[1] See also pp. 230–37.

Since I have already mentioned the Portland Cement Association, I also wish to refer to the helpful pamphlets available from the National Lumber Manufacturers' Association, those furnished by the various regional lumber associations, the common and face brick manufacturers, and many others.

You all know of the Superintendent of Documents' price list No. 72 listing government pamphlets of interest to suburbanites and home builders.

Although I have dealt mainly with the construction of new houses, I hope that the discussion and references to material will also have some application to the remodeling and modernizing of existing houses, ...

A BETTER HOMES DEMONSTRATION

[In many parts of the country farmhouses have been demonstrated as part of the Better Homes campaign.[1] The description which follows is of a farmhouse demonstrated in Illinois during the 1930 campaign. It has been planned to meet the needs of a particular family and for the type of farming carried on in that section. The following paragraphs are from "The Seven Home Essentials,"[2] by Professor W. A. Foster, University of Illinois:]

"In planning the farmhouse the individual family must be considered—their habits, tastes, thrift and needs. The size farm, the type of farming engaged in, and the returns from their operations are all important factors in both plan and cost. The farmhouse shown was planned for a family of five, the parents, two small children and one of their grandparents. They wanted a medium-sized living room with fireplace, a large dining room, a convenient kitchen, a toilet and three entrances on the first floor, in addition to a porch which could be screened and sashed in. A closed stairway to the second floor with a closet at its foot was planned. A closet for family garments was placed in the hall and a coat closet was placed in the front entry.

"The house was planned for easy communication. The grade entry is toward the other buildings. One may go from this entry directly to the basement, where a washroom for men is located, or to the kitchen, dining room, living room or toilet. It is also a simple matter to go to the second floor through the passage end of the living room.

"One chimney stack serves for furnace flue, coal-range flue and fireplace

[1] See pp. 741–48.

[2] Reprinted by permission of the *Country Gentleman*, December, 1930. Copyrighted 1930 by the Curtis Publishing Co., Philadelphia.

flue. A hood was built over the range, and the smoke flue was carried horizontally over a closet to the chimney through a cast-iron pipe which was insulated in asbestos wool and plastered over. The hood connects with the chimney. The second floor contains three fair-sized bedrooms with closets, one small bedroom, bathroom, bedding and broom closets.

FIG. 67.—Design and floor plans (Figs. 68–70) of farm home for a family of five Designed by W. A. Foster, University of Illinois.

"The second-floor hallway is small, so all rooms and parts are easily accessible.

A BASEMENT OF CONVENIENCES

"The basement contains fuel room, furnace room, workroom, and a fruit room near the foot of the stairs under the entrance—and a washroom

with sanitary closet, lavatory and shower. The pump was placed in this room under the landing.

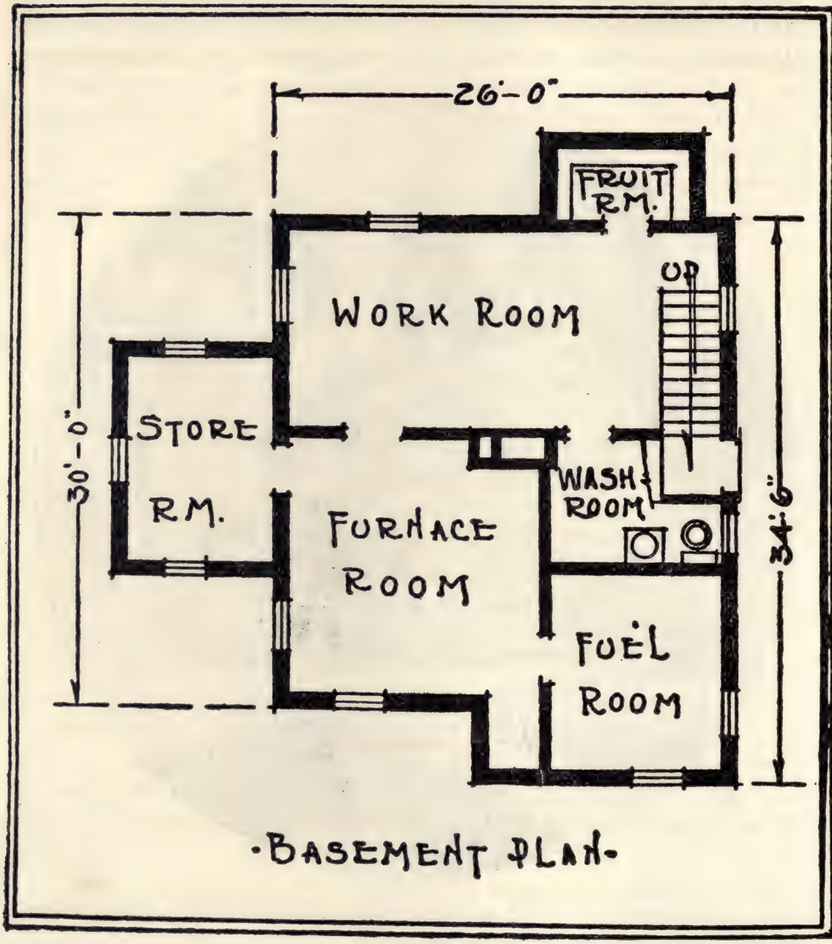

Fig. 68

"Plenty of basement windows are provided. The workroom is especially large and well lighted, making it suitable for laundry, canning and a host of other general purposes.

"The light plant was placed in the furnace room. There is also space there for a workbench.

"The stairs are contained all in one well, with an easy slope. . . . . The house was built just about a year ago at a cost of less than $8,000 including light plant, warm-air heating and plumbing.

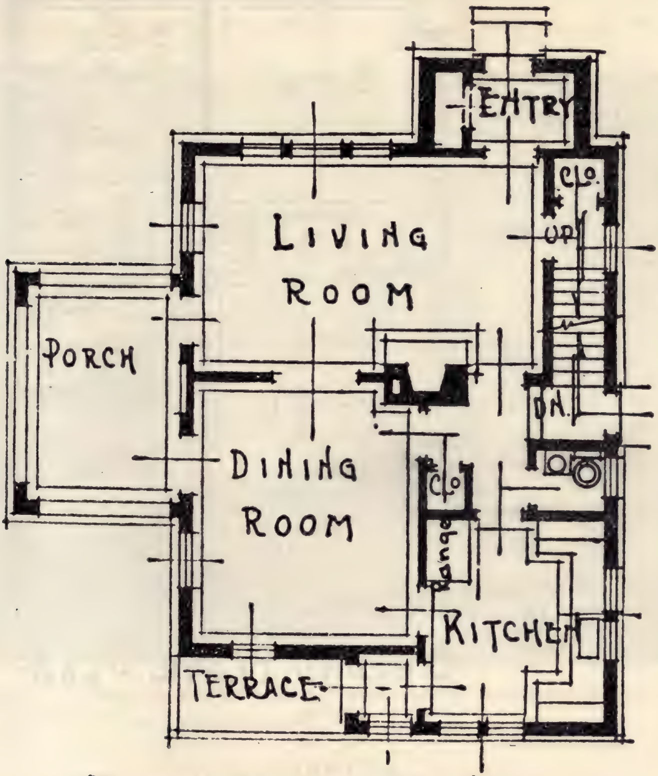

FIG. 69

"A twelve-inch concrete wall was poured of solid concrete. The superstructure is built of brick over frame—brick veneer.

"Since this house was built on a site where the old house burned down early in the summer of 1929, the construction was not started until early

fall. The house was closed in before bad weather arrived and was completely finished about midwinter."

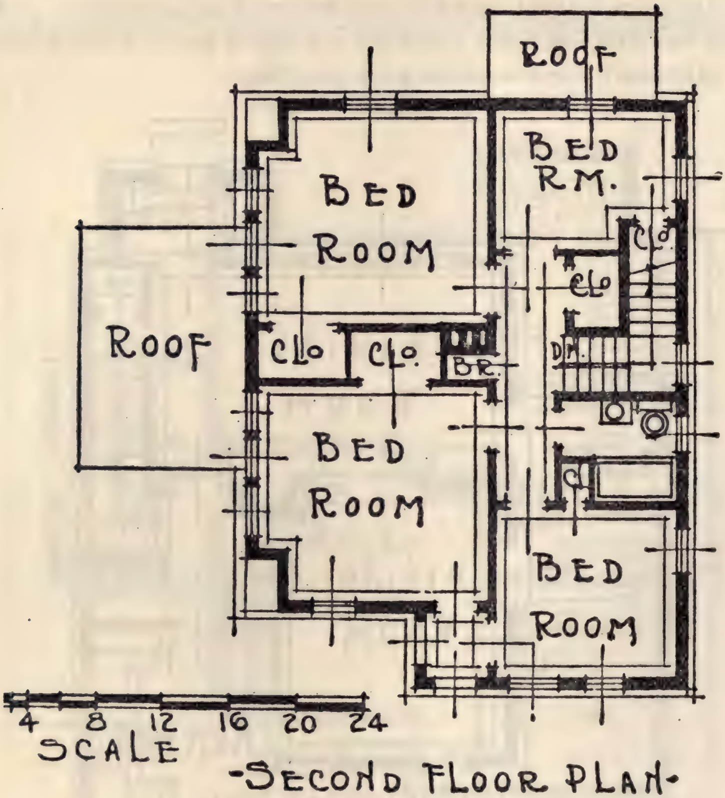

FIG. 70

SUMMARY

The house planned for the city dweller rarely meets the requirements of the farmhouse, owing to the many activities brought about by various types of farming. The domination of urban standards has made it more difficult for the rural homemaker to obtain house designs and furnishings adapted to her needs. For proper development of the rural home the following needs are essential: (1) better farmstead plans; (2) the development of a type of rural a chitecture suited to rural surroundings and needs; (3) more labor-saving devices.

The planning of a farmstead layout includes the arrangement of various buildings, yards, their interrelation, and their relation also to the fields and the highway. Although utility is of prime importance in designing the farmhouse there are other factors. The most important considerations in locating the house are: (1) access to good highway, (2) possibility of protection from objectionable winds and the utilization of desirable ones, (3) adequate drainage, (4) sufficient supply of good water,

FIG. 71.—The farm-home office requires a door leading directly out of doors. (Warren County Better Homes demonstration.)

(5) desirability of outlook. The elevation for the house should be such that thorough drainage is possible. The rooms used most should have the most pleasing outlook. The larger the house, the more the land that should be set aside for it. The relation of the house and barns should be such that the prevailing winds do not blow from the barn to the house. Farm buildings should be as few as practicable. A number of small buildings gives a cluttered appearance.

In planning urban and rural homes, living quarters, sleeping quarters, and service quarters may be common to both, but their location and their

details may differ. Considerations in planning farmhouses are: (1) The kitchen should receive special consideration in size and location. (2) The washroom, if one is included, should be accessible from the side of the house facing the farm buildings and from a hall leading directly to the dining room. (3) There should be adequate provisions for storage. (4) The location of the stairway should be such that it is accessible to those that make the most use of it. (5) The farmhouse should be planned for the activities carried on. It usually is the place also where most of the farm business is conducted. (6) Most farmhouses need to be larger than most city houses.

More liberty is possible in selecting exterior designs for the farmhouse than for the city house as there are fewer conflicting elements to consider, the plot is larger, and there are no neighboring houses. The site and other farm buildings also are the owner's own property.

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PART II

PROGRESS IN IMPROVING HOUSING CONDITIONS

CHAPTER XVIII

OUTSTANDING HOUSING PROBLEMS

1. The General Housing Problem

In discussing the general housing problem in the monograph "Housing Conditions in the New York Region," which was prepared by Thomas Adams in collaboration with Wayne D. Heydecker, the authors state:

The housing problem may be divided into two parts, one part being that which relates to securing proper conditions of land development, control of surroundings and distribution of residential growth; and the other, that of securing more and better houses. The latter is usually and mistakenly considered as the whole problem. It involves questions of construction, sanitation and internal arrangement of dwellings, and questions of building finance in relation to economic return. In the solution of this part of the problem cities require good building ordinances and consideration of methods of financing the building of homes for various groups of the population. The first part of the problem is, however, of primary importance, in the sense that it deals with basic conditions. It involves the control of land subdivision and of densities and surroundings of residential areas by means of city plans, zoning ordinances and public acquisition of open areas for small parks and playgrounds. . . . .[1]

MAIN DEFECTS IN AMERICAN HOUSING[2]

By LAWRENCE VEILLER

Executive Director, National Housing Association

The chief defects to be found in the housing conditions that prevail throughout all parts of America—not merely in the East but in the Middle West, in the far West, in the South, in the North; in the great centers of population like New York and Chicago, in cities of more moderate size, even in the small towns and villages—may be summed up as follows:

Lack of light.—Dark rooms; sometimes interior rooms without any means of light or ventilation whatsoever; insufficient open spaces; small narrow rear yards, courts and side yards that often are little better than pockets, which do not permit free circulation of air and are grossly inadequate in supplying the light necessary for the windows which open upon them.

[1] *Regional Survey of New York and Its Environs*, VI, 203.

[2] Adapted from *The Housing Problem in the United States*, "National Housing Association Publication," No. 61 (1930).

Lack of adequate ventilation.—In the modern science of ventilation moving air is the essential thing, along with absence of high temperature and too great moisture. Our houses are not so built, most of them, as to procure moving air, especially in the hot summer months. This is due to the fact that they have not been planned with reference to this purpose, and do not permit what is technically known as "cross," or "thorough," ventilation. This is only beginning to be considered in new construction in this country.

Lack of safety in case of fire.—Many houses are built entirely of wood, that is private dwellings, two-family dwellings and some multiple dwellings. Very few houses in which people live are built of fire-resistive construction. Only the homes of the millionaires or the great tall skyscraper apartments are thus built at the present time. The average private dwelling is built of wood, the average multiple dwelling is generally built of brick, in its outer walls, but the whole interior is generally of wooden construction; wooden beams and supporting members, wooden partitions and wooden stairs and halls—all of which make such buildings a great menace in the event of fire. Many such buildings are not provided with adequate means of egress in case of fire, nor with adequate fire escapes. This is particularly so in the great cities.

Most homes are badly planned.—Comparatively few of them have had the benefit of the advice of an architect in their design. Most of them have been built by speculative builders, seeking their own profit and with little knowledge of sound principles of home planning.

It is the exception rather than the rule where homes are planned with regard to the functions that are to be performed in them—notably so with reference to the kitchens, or places in which the housewife spends most of her time; what has been very aptly described as the "housewife's workshop."

Little or no thought has been given to the work that is to be done by the housewife, so as to save her unnecessary steps, although there are 26,000,000 housewives in the United States—no small element of the population and one well worthy of consideration in planning their workshops. A careful study made recently by Government officials of typical groups of over 2,000 housewives disclosed the fact that one-third of the housewives spend 56 hours of the week or more in their homemaking, a half of them spend between 42 hours and 56 hours at these tasks, and the average about 51 hours a week, which is the equivalent of a full workingman's week spent at his labor.

That much could be done in planning kitchens scientifically is disclosed by the fact that the average housewife in doing her housework walks six miles a day. When kitchens are scientifically arranged, it has been found that that amount has been reduced to but four miles a day. In the light of these facts the intelligent and scientific planning of kitchens assumes new significance. There is a change, however, coming, and in future our homes will be more intelligently planned.

Houses are not only badly planned but as a rule they are badly built: This is due to the system of building houses on speculation, instead of having the person who is to live in the house build the house for his own use. Where that happens the houses are generally well built. But that is the exception and not the rule. The great mass of houses in America, especially the homes of working people, are built by speculative builders who seek to make a quick profit. Consequently, there is an incentive to slight the work, to build cheaply, to substitute inferior materials, and no incentive to good workmanship. They have little or no concern whether the house lasts a long time or soon needs repairs, for they will have sold the house long before that time and will have no concern with it. The more they can "skin" it, as the phrase goes, the more profit for them. As a result, the great mass of our houses in America are badly built. Many need repainting and repairs within a few months after the family has moved in. The plumbing wears out quickly, everything has to be renewed much sooner than it should; so that this kind of building is a very distinct discouragement to investment in a home on the part of the average man. This is undoubtedly one of the factors in the great increase in the number of rented homes in the United States in recent years.

And finally, most of our homes cost too much.—The cost of building in the United States is very high. . . . .[1] The cost of the average small home in the United States has risen 19 per cent during the past six years and is still climbing. The chief reason for this is in the high wages paid to labor in the building industry and in the manufacture of materials that enter into a building. One observer commenting on this said recently:

> The cost of housing through public indifference and timidities of politicians has been permitted to mount out of all proportion to other items in the cost of living. A thousand dollars' worth of automobile or of many other articles to-day means more than twenty years ago, while a thousand dollars' worth of building construction means considerably less.

[1] For further information on costs, see chap. ii.

HIGH FINANCING COSTS

The high cost of housing in the United States is not, however, to be attributed solely to these factors. There are many others that enter into the situation. As most houses are built on borrowed money, the cost of financing such enterprises is unduly high. Money is easily obtainable for the first mortgage at reasonable rates of interest, varying from five to six per cent in different parts of the country; but when it comes to borrowing the funds necessary to cover one-third of the cost of the enterprise, generally covered by what is known as a second mortgage, the rates for such financing are apt to be high—due to the risk and the need of money.

There are undoubtedly economies that could be brought about in house construction through mass production and through other means. The fact remains, however, that, speaking generally for the whole country, the cost is much too high at the present time. In fact, it is no exaggeration to say that in most parts of the country there have been few new houses built since the War for the occupancy of the average workingman. He has had to be content with older houses, houses that have been vacated by more prosperous people.

There is still much to be done in this direction. There is need for research in the field of building materials and building processes, from which there should result economies in the construction of our future houses. That such economies are likely to result seems to be apparent. There are already signs visible of radical and startling changes in this part of the field of housing.

BAD METHODS OF SUBDIVIDING PROPERTY

Another factor in the housing situation is found in the unintelligent method of subdividing property that has prevailed in most of our cities until recent years. The prevailing method of laying out a city is what is known as the "grid-iron" plan. Cities have generally been laid out on rectangular lines, and property has been subdivided without much regard to the kind of use which was to be made of it.

In fact, until very recently—until the advent of the so-called Zoning movement in the United States—it has not been possible to predict with any degree of accuracy or finality just how a given part of a city would be used. Property has been laid out so that it would be susceptible of almost any use, either for residence purposes, for commercial purposes or for manufacturing purposes, and lots have been narrow and deep. The result has been that it has been practically impossible to design the right kind

of a home on such a lot. For, being narrow and deep, it has not been possible to leave a sufficient amount of open space on all four sides of the house. Consequently, where open space has been left at each side of the house in what is known as side yards, these spaces have generally been very inadequate in width, often as narrow as three feet, furnishing neither adequate light nor ventilation, but serving often as unpleasant pockets of barren land which often have become receptacles for cast-off materials, especially in the workingmen's quarters of the town.

THE SLUMS

We also have developed slums in America—those sores of the old world cities. It might have been supposed that in a new country like the United States, with opportunity to develop as we wished, with all the land that we could possibly desire at low prices, these objectionable features of an older civilization would not be repeated.

Unfortunately, however, some cities of America not only have developed slums but have the worst slums in the civilized world; this is notably so of New York and of some parts of Chicago, Cincinnati, St. Louis, Cleveland and other cities.

It would not be accurate to say that slums prevail generally in America. What is true, however, is that we have slum spots or small sections of slums in all of our great cities. Fortunately, these are not very great in extent in most of the cities and can be remedied. They do, however, possess all the usual characteristics of the slum and produce the kind of crop that is to be expected from such conditions.

WHAT IS BEING DONE?

We have been conscious of a housing problem in America for nearly 100 years. That is a very long time in the history of so comparatively young a country as the United States. It may very properly be asked, therefore, "What has been done to remedy bad housing conditions in this country and what is being done at the present time?"

While we have been conscious of housing evils for nearly a century, that consciousness has existed only in the great cosmopolitan centers, particularly in the city of New York. Outside of New York there has been a consciousness of need of effort for housing reform for more than a period of 25 years.

There are various movements on foot—national in their scope—seeking to deal with the situation. Various citizens' organizations that have been

formed by public spirited men and women who are conscious of the evils that flow from the neglect of such conditions and who are anxious to take steps in a practical way to prevent their growth, and to remedy existing evils—so far as they are remediable.

THE HOUSING PROBLEM OF THE LOW-INCOME GROUPS[1]

By LAWSON PURDY
General Director, Charity Organization Society, City of New York

Housing is often regarded as a problem unrelated to other aspects of the life of a community. Housing is really one part of the great economic problem of all time, namely, that of the production and distribution of wealth.

I suppose that the extent to which man has taken thought for his house has been a rough measure of his advance in civilization. The actual house that covers him is but a part of the housing problem. The housing problem is conditioned by the supply of water and a system of sewerage. There were fine houses in classical times and fine houses in the middle ages for the rich, but there was not much safety from disease, for adequate drainage is of very recent date; so is a pure water supply. It is not many years ago that the general theory was discovered, and yet before that discovery it was commonly deemed very unsafe on the continent of Europe to drink water. Water at best was for washing, not for internal use. They did not know why it was dangerous but they rightly concluded that it was dangerous. So in my youth in this country night air was regarded as dangerous. In the heat of summer prudent persons kept their windows shut. It was possibly well that they did so, for they excluded the mosquitoes that would have given them malaria. They did not know why they kept their windows shut, but there was a reason. . . . . In most growing cities of the United States the worst housing conditions are to be found where houses built for the use of one family are used for many families either with or without some structural changes. A large majority of the people of the United States are housed in wooden buildings constructed for the use of one family. If properly constructed and adequately spaced, they afford very good homes indeed. When poorly constructed and placed close together they are insanitary and constitute a serious fire hazard. . . . .

We have interfered with the production of wealth by tariffs and various forms of stupid taxes but in spite of these interferences our natural advantages have been so great that the production of wealth has increased at

[1] Adapted from "The Housing of the Very Poor" (abstract of a paper read before the International Housing and Town Planning Congress, Paris), *American City*, July, 1928.

an amazing speed. We have interfered with the equitable distribution of this wealth and so have reduced the quantity of production as well as given to some persons more than they earn, with a consequence that the other persons have received less than they earn. If all governmental interference were swept away, it would seem to-day that the power to produce wealth in the United States is so tremendous that every family should be well housed according to the standards of to-day. We know that they are not, but that they are well housed on the average according to the standards of not long ago. . . . .

WHAT OF THE FUTURE?

The United States has been rich enough to house its people fairly well. It has not been intelligent enough to devise appropriate housing codes, and zoning only started in 1916. There is a theory in the minds of some that public money should be used to erect houses for the poorest people. Never in the history of cities in the United States has it been common for the poorest people to live in new houses. It is very hard to see why they should. Because we have permitted the erection of poorly-planned houses and poorly-constructed houses, our old houses have been unfit to live in; but according to the standards of to-day they never were fit to live in. We know now that it costs less per room to construct a well-planned multi-family house than it does to construct a badly-planned multi-family house. The badly-planned house that is unsafe in case of fire, that has inadequate light and air, never is a good house. If the multi-family house is planned so that every room has adequate windows opening on adequate open spaces, if the sanitary conveniences are adequate and the house is properly constructed so that it shall be safe, that house may be a good home for a hundred years.

There is a terrible economic waste in building badly-planned houses. There is a great economic gain in building houses to serve efficiently throughout a longer life.

We only made a beginning in 1916 in the city of New York, and in the United States generally, to zone our streets so as to avoid the intrusion into residential areas of buildings the use of which destroys the value for residential purposes of the houses already there. We have made a beginning. We have safeguarded residential areas so that they should continue to be satisfactory places for residences for a long time to come; in any event for a longer time than if they were without this protection. With the wealth we have, we should be able to have an annual crop of new buildings

sufficient to take care of the increase in population and, in addition, to furnish space enough to permit the destruction of a large number every year of the houses which for one reason or another are not reasonably fit for habitation.

Through governmental means we can bring about the more rapid destruction of unfit houses, but it seems highly probable under the conditions of this country that, if we use public money to erect new ones, we shall discourage the use of a still larger sum of money by private builders and so will not hasten the day when any community will be housed as we would like to see it housed. Short-cuts are attractive, but often they are the longest way around.

So far as we have a very poor class in our cities, it seems probable that in the future they will be housed as they have been in the past. I do not mean that they will be housed in such poor buildings but they will occupy generally the oldest and poorest buildings. In the borough of Manhattan, city of New York, the standard of housing for very poor people is shown by the character of the dwellings of the families under the care of the Charity Organization Society, of whom there have been usually from 3,000 to 5,000 each year. The normal apartment occupied by these families in 1920 consisted of three rooms and the rent was $14 a month. The housing shortage had not at that time operated to increase rents by very much. After that date rents rose very rapidly until in 1926 for the same apartments the average rent was $23.96 a month. The tendency to-day is in the other direction, but is not much shown yet by a decline in rentals.

In a housing shortage we first find a deficiency of apartments vacant, and apartments in very bad houses occupied at rents about equal to the rent of the poorest apartments previously occupied. When the housing shortage became intense and all the apartments were occupied, rents rose. . . . . It is obvious that rents will soon go down. With declining rents and numerous vacancies, the time is not distant when the poorest houses will be torn down. Each year on the average we build enough houses to take care of the increase of population and of all the persons who are removed from houses that are destroyed. The tendency is for a gradual move from the bottom toward the top. The more prosperous persons move into the new houses, the next grade takes the place of those who have moved, ... Our task is to see that enough houses are built for the more prosperous persons, that they are so well built and so well planned that no matter how old they may be they will always be satisfactory dwellings.

A STANDARD FOR ALL NEW DWELLINGS[1]

By setting a definite standard below which no dwelling may be erected standards of housing gradually become higher, for old houses are demolished and families move into better homes. John Ihlder, who is executive director of the Pittsburgh Housing Association, has emphasized the fact that the poorest house must be fit to live in. Mr. Ihlder states:

. . . . the improvement of housing conditions, if it is to go far enough to meet the need adequately, must be based on sound economics. Philanthropic housing, housing with a deficit, can never serve more than a favored few. Its great contribution lies not in what it does for its tenants, but in demonstration of methods and their results that may be given general application.

There is probably no subject in the social field which contains so much emotion as housing. It deals with the family, the essential unit of society. It deals with children, with whom lies all the future.

England learned how great is the emotional phase of housing when, at the close of the World War, its soldiers who had fought for their homes returned to find there were no homes for them. In order to avoid worse troubles, England embarked upon a great program of government-built dwellings, though it knew that what it was doing was unsound economically.

We were fortunate in that we had only two years of war with its check on building, as against England's four years. We again were fortunate in that having built our cities to care for a great stream of immigration, the war and later the quota law cut that stream to a driblet. Because of this we had housing accommodations, of a sort, to care for our normal increase of population.

So we were able to go through the crisis without a great government house-building program. We were able to continue our dependence upon private enterprise. We must recognize, however, that private enterprise first met the needs of the well-to-do. It did this so well that in many cities we are now over-built in houses costing $8,000 and up. Now private enterprise, in order to keep its organizations going, is looking for new work, is becoming interested in less expensive dwellings. Every time $500 or $1,000 is cut from the price of a house, a new market is opened. Gradually we are approaching the condition of before the war when there was contact between new houses and the poorer old houses and when, in consequence, there was a steady progression of tenants from bad to fair to good to better dwellings.

SLUMS AN INCREASED MENACE

But we must hasten this process. Slums and slum dwellings are a greater menace to America to-day than they were before the war. The immigration quota, the fact that to-day more than half our population lives in cities and towns, mean that the majority of Americans from now on, the majority of our citizens and workers, will be born and reared in our cities. . . . .

[1] From *Better Dwellings—Work of the Pittsburgh Housing Association.*

THE POOREST HOUSES FIT TO LIVE IN

We must face the fact that there always are people who will accept the cheapest thing that is offered, no matter how poor it is, no matter how expensive it will prove in the long run. So, in such a vital matter as housing we must see to it that the poorest offered is at least a fit place in which to live.

TWELVE HOUSING NEEDS OF AMERICAN CITIES[1]

By HAROLD S. BUTTENHEIM
Editor, *American City*

[A summary from addresses at the recent conventions of the Massachusetts Federation of Planning Boards, National Association of Civic Secretaries, Pennsylvania Housing and Town Planning Association, and Pennsylvania Association of Planning Commissioners.]

1. A reasonably accurate picture, based on a careful survey kept constantly up to date, of what our local housing conditions actually are.

2. A clear-cut assignment and acceptance of obligations for housing betterment between the municipal government on the one hand and individuals on the other.

3. Vigorous and effective action, by civic and welfare organizations, as spurs and guides to public and private activity.

4. The adoption and enforcement of building and housing codes which will require the highest structural and sanitary standards consistent with reasonable economy in construction costs.

5. The adoption and enforcement of a comprehensive zoning ordinance which will not allow anti-social or needlessly intensive use of the land in any part of the community.

6. Accurate assessment of real estate and more scientific use of the taxing power and of excess condemnation as incentives or aids to adequate and low-cost housing.

7. Adequate control of new real-estate subdivisions.

8. Intelligent consideration by the city government of the effects on housing betterment and slum prevention of foresighted city planning, adequate transportation, and municipal improvements, such as street widening and paving, playground development, and extensions to the sewerage system.

9. Maintenance of sanitary and safety standards, including periodic inspection of multi-family buildings, and education of tenants by the

[1] In *American City*, April, 1930.

health and fire departments; and insistence on the rehabilitation or demolition of buildings when slum conditions begin to develop.

10. General acceptance by landowners, building developers, and realtors of the fact that their activities have an inescapable relationship to the public welfare.

11. Greater willingness by men of means and financial institutions to invest liberally in large-scale, low-cost housing enterprises, thus helping to solve the housing problem for the lower economic groups.

12. Realization that adequate and wholesome housing for all its members is of vital importance to the whole community, and that, if any families or individuals are unable to pay a fair return upon its cost, proper housing must nevertheless be provided for them. Any discrepancies between economic rent and ability to pay should be met by additions to income, not by reducing rents below an economic level. For those capable of self-support, the line of progress lies in raising wage-rates and in training for more productive labor; while those who are physically or mentally incapable of earning a living wage must be frankly accepted as charges upon the community.

PUBLIC RESPONSIBILITY FOR HOUSING[1]

By THOMAS ADAMS
Planning Consultant
AND
WAYNE D. HEYDECKER
Acting Director, Regional Plan Association, Inc., New York City

. . . . There are persons who are unable to pay an economic rent for healthful housing accommodations. In every state of society at all times there is a group of persons who cannot pay for such accommodation any more than they can pay for ample supplies of good food and clothing. . . . . Their problem is not really a housing problem but one in which processes of social readjustment and charity have to be employed to make up the difference between earnings and cost of actual subsistence. It is equally wrong to describe the plight of this class, in regard to their inability to pay for decent homes, as a housing problem, as it is to call their lack of other necessities a food or clothing problem. In the presence of superabundance of food many have to go without a sufficiency for health. With more than enough healthful shelter awaiting tenants, many have to live in

[1] Adapted from "Housing Conditions in the New York Region," *Regional Plan of New York and Its Environs*, VI (1931), 281–84.

unhealthful quarters. In times of plenty in housing accommodation there is little lessening of slum evils and overcrowding as compared with times of scarcity. To the extent that better housing accommodation for those who suffer from poverty needs to be provided by public aid, it should be regarded as a charity, for the same reasons that giving food or clothing is a charity. One of the great mistakes in the past has been in regarding this charitable work in housing as distinct from other forms of charity. The confusion which occurs in discussing remedies for housing and the desirability or otherwise of applying public aid is largely due to this mistake. No one can object to giving charity in the form of shelter, as of other necessities. But it cannot be given for housing alone. If it is given as a relief of rent, as a subsidy toward cost of building, or as tax exemption, then whatever its direct object or result, it becomes in effect a contribution toward all necessities of life.

We have to bear this in mind in discussing public aid to housing. Such aid is necessary so far as public contributions to relieve poverty are necessary. The real questions, however, are whether public aid to housing should be given on some ground of public responsibility for shelter that does not apply to other necessities, and whether this aid should be dispensed among those whose earnings are sufficient to enable them to live without state aid.

Of course the question of what are sufficient earnings will always be difficult to determine, and agreement between different schools of political philosophy will always be impossible. When, however, we are discussing the giving of state aid in the form of housing to citizens who can be self-supporting, we are discussing a form of socialism and not of charity.

In many countries socialistic forms of state aid have been given and in most cases have been mixed up with charity. One of the chief complaints to be made against these enterprises is that they hardly ever reach those who need charity and they use funds that should be devoted to charity. They too often give aid to groups of people whose needs are no greater than other groups and at the expense of these other groups.

It is not to be ignored, however, that public aid in the improvement of housing conditions may have to be given in some cases as payment of a public debt to society. For example, if over many years a public authority has permitted congested and insanitary building conditions, which are a menace to public health in general, to grow up in a city, it may be a public duty to spend the money to get rid of these conditions. Strictly speaking, this also is not a contribution to housing any more than widening a con-

gested street to allow traffic to move is a contribution to the motor industry. It is a contribution toward relief of defective structural growth which society may have to pay for its own protection. Slum clearance comes to a large extent within the latter category, rather than being a measure of housing reform. If it were possible to segregate the three problems of housing, poverty and city reconstruction, we should see more clearly how to attack the housing problem.

Admitting that state or municipal aid is necessary for relief of poverty or for physical reconstruction of defective parts of a city, is it also desirable to give such aid to the provision and improvement of houses for the vast body of workers who are able to earn means of subsistence? In a society based on the philosophy of individual liberty and democratic institutions the answer would be no, except in such emergencies as existed during and after the World War.

Whatever may have been the main object of giving public aid in those countries where it has been given, it will be found that in every case there has been a mixture of motives, and some confusion between what is charitable, what is socialistic, what is an emergency measure, and what is merely payment of a public debt for past mal-administration of building growth for which both the public and their officials share responsibility.

PUBLIC AID AND PRIVATE ENTERPRISE

Whatever objections there may be to public aid, it has to be admitted that in some circumstances no housing improvement is possible without it. The difficulty is to obtain the improvement without doing more harm than good. When it is necessary to grant public aid, it should be given as a last resource after other means of supplying accommodation have failed, and it should be given in a form that will assist rather than impede private operations in house building. It may be accepted as an axiom that the best way to supply new houses for those who can pay for them is by private enterprise, subject to adequate government control. When public aid takes the form of financing the building of houses to rent at less than is required to meet the reasonable requirements of private investors, this eliminates private building of such houses. When rents of existing houses are artificially restricted, the effect is the same. When, however, public aid is given toward the purchase of land for parks and playgrounds, or to the construction of public utilities that cannot be made self-supporting, the result is to stimulate private effort in building.

To withhold public aid toward the building of new houses is not neces-

sarily to leave the problem unsolved. It has to be recognized that old houses represent the largest proportion of dwellings in a city and that a very large number of the population must always live in old houses. It is not only impossible to build and rent new houses as a commercial proposition for the very poor, but also for a substantial proportion of those whose earnings are adequate to make them self-supporting. In other words, a large percentage of workingmen who are not in the poverty class are able to live only in old houses. In these circumstances, it may be asked, why must the solution of the housing of the very poor consist of building new houses, when so many who are comparatively well off must live in old houses? Why should charitable means be employed to subsidize new houses for those who can pay least, partly at the cost of those whose means are insufficient to enable them to live in new houses?

In cases where public bodies cannot provide new houses without giving charity, it follows that private enterprise cannot do so. It has to be recognized that new houses cannot be built to compete with old houses when there are sufficient of the latter to meet demands. So long as old houses are required to be healthful, there is no reason to disregard economic conditions by forcing the erection of new houses for those who can least afford them. There will always be large numbers who can afford only the cast-off houses of those slightly better off than themselves. So long as these cast-off houses are healthful and not overcrowded on the land, they may form wholesome accommodation. The public authorities are responsible for seeing that such houses are made and kept in good habitable condition, first, by requiring old houses to be kept in good repair, and, second, by purchasing land to open up congested areas.

Rent restriction.—The granting of financial aid for house building may interfere with private enterprise less than some forms of restriction. To restrict rents artificially, however necessary as a temporary expedient, cannot be regarded as sound from an economic point of view. If carried to a certain degree, it makes public aid to building a necessity, as has been the case in England. Proper restrictive measures are those which prevent abuses and nuisances such as the overcrowding of land with building or the occupation of unhealthful premises. Where houses conform to proper health standards, there should be no interference with the law of supply and demand by government restriction of rents, which inevitably results in reducing the supply. Where rent restriction has been applied in New York, its justification has been that the war created an emergency which had to be met to protect tenants against the greed of landlords. It may

have been necessary as a temporary measure. In England the restrictions have been maintained long after the emergency has ceased to exist, and great numbers of tenants are making large profits there out of other tenants and out of losses of the landlords, while other great numbers of tenants have to pay higher rents for unrestricted premises because of the effect of the restriction in preventing the supply of new houses. The *New York Times*, on March 28, 1856, remarked in desperation, in referring to the greed of landlords, "Our experience, like that of the cities of the Old World, is that the avarice of capitalists renders governmental interference for the protection of the poor and the unfortunate an absolute necessity."

Exactly the same propensity was in evidence in 1920, according to the testimony before the State Housing Commission, and again in 1923. It appears to make no difference who the landlords are. As one writer said, "If the tenants of to-day were to become the landlords of to-morrow, and the landlords the tenants, the same extortion would exist, for it is inherent in the system." This is precisely what happens. Tenants who enjoy rent restriction become in effect a protected class having the power as temporary landlords to make money out of sub-tenants. Avarice cannot be controlled by a law which assumes that it is restricted to one class of citizens, and protection of the poor cannot be obtained by restrictions that make building unprofitable as an investment.

Rent restriction was first adopted in America in the District of Columbia, by direction of Congress, in 1919. The states of Wisconsin and New York adopted restrictive measures in 1920. Testimony given in 1923 before the National Housing Conference in Philadelphia and before the New York State Housing Commission, while conflicting in many respects, seemed to agree that the acts had been beneficial to tenants in actual possession, but at the same time were frequently unfair to the landlords and therefore had served as a deterrent to further building, notwithstanding the fact that they applied only to buildings existing at the time of their adoption.

FORMS OF STATE AND MUNICIPAL AID

When state or municipal aid must be given, the degree and form it takes will have much to do with the wisdom or propriety of giving it. Whether or not it should be given depends on what it is given for, how it is given, and whether general public benefit is obtained as a result. There is good reason to doubt the methods followed in some countries in building or subsidizing the building of houses for one group of the community at

the expense of other groups, and it is equally questionable whether cheaper money or limited tax exemption can be given an equitable basis.

In connection with the reconstruction of slum areas and the renovation of blighted districts, much public aid to housing can be undertaken without actual subsidizing of house building as a charitable undertaking. When this reconstruction or renovation is essential for the benefit of the whole community, it may properly be paid for out of the public purse and the incidental housing improvement may be welcomed. There are cases also where a government may properly incur expense to create an object lesson in better housing. One thing which it is always proper for a government to do is to purchase land for small parks and playgrounds as a means of providing more space in congested areas, and it is in this respect that so much can be done as a means of removing one of the worst defects of slum districts.

When state or municipal aid is given, it usually takes one or more of the following forms: First, granting loans at low rates of interest to individuals, public-utility societies or municipalities; second, granting outright subsidies to individuals or to others for the construction of houses having a certain standard; third, direct state action to provide houses for sale or for rent; and fourth, exempting houses of a specified cost and character from taxation for a limited time.

2. Problems of Housing and Health

FACTORS OF BAD HOUSING THAT CONTRIBUTE TO ILL HEALTH[1]

By JAMES FORD

Executive Director of Better Homes in America

. . . . To remove the forms of ill health which are produced by housing conditions, we must, therefore, discover the specific cause of each house disease and remove that cause. This is not easy, because many of the suggested correlations are still under dispute, but pending final agreement on the part of specialists, we must act, as in all other matters of human policy, upon tentative conclusions which may be accepted as reasonable.

Our problem may first be considered with reference to the types of houses which have been or may be constructed. Men may live in detached houses, in semi-detached or row houses, or they may live in flats—de-

[1] Adapted from "Bad Housing and Ill Health," *National Conference of Social Work Proceedings, 46th Annual Meeting, Atlantic City, 1919* (Chicago: The Conference, 1920), pp. 237–41.

tached, semi-detached or in rows—or in block dwellings, tenements, apartments, hotels or lodging houses. Of these types mentioned, unquestionably the worst, under usual conditions, is the multiple dwelling; and although these, if properly planned within and properly placed on the lot, can be rendered tolerably wholesome, they inevitably contain at best features which render them far from ideal as places of permanent residences.

Let us take for example the prevailing type of multiple dwelling as found in our American cities. This is a structure four, five or six stories high, and perhaps higher, built largely of wood, but with brick exterior, three or four rooms deep, sharing party walls with similar buildings to right and left, sharing with its neighbors a narrow court or shaft at the sides and an ugly yard at the rear filled with clothes lines and drying clothes, outbuildings and board fences, and probably ash, garbage and refuse cans, and sharing with its neighbors to the front an ugly, monotonous, treeless, dusty paved street. The picture above given, which describes the urban homes of the middle classes, does not describe the homes of our wage earners who constitute the major part of our urban population, for to it must be added the inevitable dark hallway, the common toilet, often located in hall, cellar or yard, the disrepair and the stench from unclean cellars, halls, yards, from cooking and washing, from unsanitary plumbing, and from years of careless usage.

Such dwellings as have just been described may contribute to ill health on the part of their occupants (even though these tenements or apartments are newly constructed) in the following ways:

1. Through improper location by building on wet and imperfectly drained land; the buildings, especially the lower stories, may be damp, and dampness tends to lower resistance to disease. Or by placing the building in a highly-exposed position, proper heating in winter season may be impossible for many rooms and such exposure may reduce resistance.

2. Through the characteristic use of wood for interior, if not exterior, construction, tenants are exposed to a continuous fire risk. Few tenements or apartment houses have more than one fireproof means of egress, if any is provided, so each family is continuously exposed by the carelessness of all the other families in the building. A tenement-house fire may mean not only the possibility of death from burning, but also the greater probability of suffocation or accident. Perhaps the form of ill health which is most lasting in its effects is occasioned by fright, which may cause sleeplessness or even permanent nervous impairment.

3. Through defective structure or bad repair there may be continuous

danger to life and limb from accident. Winding stairs take their annual toll in broken limbs; rotten flooring, insecure railings of stairs and piazzas or fire escapes insecurely attached are causes of many of the diseases technically classified as traumatic.

4. Through defective orientation with reference both to the points of the compass and to neighboring buildings, tenants may be deprived of sunshine and even of adequate light. Many of our cities have planned, and continue to plan, streets running due east and west. If the apartments are built up to their side-lot lines, approximately half of their rooms are sunless. The absence of sunshine generally means dampness, cheerlessness, and for those thousands of flats which have no sunlighted room a reduced resistance and an increased exposure to disease, for sunshine is an effective germicide as well as a promoter of improved metabolism. The sunless room or apartment facing the north or facing a narrow court or yard shadowed by neighboring buildings is, therefore, a favorable medium for the transmission of certain respiratory diseases.

5. Through excessive height, for high buildings may contribute to ill health, not only by increasing the fire risk and shutting out sunshine as above mentioned, but also by necessitating stair climbing, which is a hardship to the aged and a limitation to the play activities of the very young, and often a source of pain, if not positive danger, to women who are about to become mothers. Tenement houses have no elevators and, hence, persons in poor health living above the second floor, to avoid stair climbing, will do without out-of-door exercise which is essential to their health.

6. Through the crowding of many families in the same building, sharing the same halls and perhaps the same toilets, the chances of exposure to certain infectious and contagious diseases are increased. The common stair railing touched by all who go in or out is a fomes by which common colds or other diseases of the respiratory system may be transmitted via the hands of the infected person to the hands of the new victim. The unwashed hand may soon be carried to the mouth and the infection accomplished. Though this mode of transmission is perhaps less serious than the common hand towel or drinking glass, it is not negligible, especially where halls are dark, for the railing is more used in such halls and sunlight does not exercise its germicidal action.

7. Through crowding of population within the tenement, block, or district, for, whether among rich or poor, density of population further adds to ill health by the nervous wear and tear which it entails. It is difficult to

secure relief from the noises made by your neighbor, who insists upon moving around his furniture late at night, or walks the floor with his crying baby, or plays his pianola, victrola or cornet during the hours when you wish to concentrate upon your work or to sleep. Moreover, where there is large population there must be considerable traffic of persons returning home or delivering goods or making visits, and such traffic means noise, which in turn means nervous fatigue and sleeplessness. As sleep is essential to the repair of the body after the fatigue and wear and tear of the day's activities, the sleeplessness entailed by crowded living must be considered one of the most serious of the sources of reduced resistance or ill health on the part of the tenement dweller.

8. Through crowding of rooms. Crowding may be caused by shortage of housing, poverty, or ignorant racial habit. It almost inevitably means increased opportunities for a communication of disease, either by direct contact, fomites or droplet infection. Where there is crowding of lodgers in the same apartment with the family there are reduced opportunities for privacy and perhaps for the accepted decencies of life, which may be an occasion in conjunction with other causes for immorality with its train of sexual diseases, or for excessive sexual stimulation, especially on the part of the adolescent, resulting in perversions or neurasthenic tendencies.

9. Through inadequate plumbing or the use of undesirable or defective fixtures which may mean reduced cleanliness and in various ways increased opportunity for transmission of diseases. Lack of water supply within an apartment makes personal cleanliness and house cleaning difficult. Broken or imperfectly trapped fixtures mean that occupants must continually breathe sewer gas. Though sewer gas has been determined to be free of bacteria, its presence in an apartment leads to discomfort, reduced appetite and imperfect nutrition, and in extreme cases to nausea. Where fixtures must be shared by several families there is danger of transmission of venereal diseases and of body parasites.

10. Through poor ventilation. The habitual use of windowless rooms, of rooms on narrow closed courts, or even of rooms having only one window, where, for reasons of privacy the door must be kept closed, means at least discomfort from hot, humid, stale air and probably reduced resistance to disease.

11. Through poor lighting. Dark rooms cause ill health in a variety of ways. In the first place, a room which is dark is likely to be dirty, because the dirt cannot be seen. Such dirt may contain disease germs, and may contaminate hands or throat and lungs. Families living and working in

imperfectly lighted rooms are likely also to suffer from eyestrain. When members of the family do housework, sew or read in such rooms for long periods, there may result permanent impairment of the vision, of which chronic headaches are the usual symptom. Careful experiments by the Boston Board of Health have demonstrated that the germs of tuberculosis can retain their virulence in such rooms for a period of more than two months. As a great many deaths in America are from tuberculosis and as there are a number of living cases in our population for each death, and as also the tenement-house population changes residence frequently, the chances of transmission of this disease from one family to another should not be considered negligible, though other methods of transmission of this disease are more common. If, as is frequently the case, all of the rooms of a tenement are gloomy, the resistance of those members of the family who are forced to pass their days in the home is almost certain to be reduced, for human beings, like plants, need sunshine for vigorous growth. Experiments seem to indicate that living in gloomy quarters, especially where accompanied by lack of exercise, results in a reduction of the phagocytic power of the blood; that is the power to destroy germ organisms, and an anemic condition also may result.

12. Through improper equipment. Defective or imperfect equipment may injure health in a variety of ways. A sink which is set too low means back strain for the housekeeper. A leaky stove may endanger the lives of the tenants from carbon monoxide. Defective gas fixtures may cause poisoning and defective electric wiring may cause danger to life from fire or shock. Careless insertion of plumbing or heating fixtures may make it possible for vermin and insect pests which are disease carriers to pass from the apartments of careless tenants to those of careful housekeepers. Lack of screens or defective screening may expose to mosquitoes, which are bearers of malaria, or to flies, which may be carriers of typhoid fever in cities where modern plumbing is not universal, or of the intestinal infections of infants.

13. Finally, the proximity of the tenement to the factory may mean poisoning of the air by chemical gases, mineral dust or soot, causing throat irritation and reduced resistance to respiratory diseases, as well as increased work for the overburdened housewife in keeping her curtains clean and her home free from dust.

The effects of the discomfort of an uncongenial environment are cumulative. Continuous living in such quarters tends to produce irritability, anemia and lassitude, or what is popularly called the "Slum Disease."

Some of the undesirable features in house construction which have been mentioned are actually reducing resistance or causing disease to the vast majority of the persons now living in multiple dwellings and are inherent in that type of dwelling. In comparison with the multiple dwelling the detached house is far more conducive to high resistance and good health. With a little attention to planning, it can be made structurally safe and every room can be well lighted, well ventilated and equipped for the comfort and convenience of its occupants. For families with children it is the ideal place of residence, as it makes possible not only good health, but opportunities for protection from undesirable associates. It also makes possible supervised play activities and through the household garden offers the children opportunity for familiarity with plants and flowers —an essential part of every child's education.

BAD HOUSING AND INFANT MORTALITY

The United States Children's Bureau has made a number of studies which show a close relationship between high infant mortality rates and bad housing. It is obvious that other factors such as low standards of living induced by poverty affect these mortality rates, yet the figures indicate that bad housing is a contributing cause.

The Manchester, New Hampshire, study shows an infant mortality rate of 236.6 per 1,000 births in tenements with seven or more families. In single-family dwellings the rate was but 86.1. The study in Waterbury, Connecticut, also shows that the infant mortality rate increased in proportion to the number of tenants per dwelling. The mortality rate for alley houses was 172.0 against 120.6 for houses facing the street. Room congestion also affected the rate.

The Johnstown, Pennsylvania, study made by the Bureau again indicates the influence of bad housing on infant mortality. The Bureau studied the infant mortality rate in relation to both dry and damp houses. In the former the rate was 122.5 per 1,000 births while in damp houses it was as high as 156.7 per 1,000. For a total of 1,389 infants living at least one month, the infant mortality rate was 28.1 where the babies slept in rooms well ventilated and 169.2 for houses where rooms were considered poorly ventilated. The Johnstown study also revealed a higher infant mortality rate in those houses where water had to be carried into the house and also where there were no bathtubs.

HEALTH AND HOUSING[1]

By WAYNE D. HEYDECKER
Acting Director, Regional Plan Association, Inc., New York City

When the Committee on the Regional Plan of New York four or five years ago began its study to determine how residential areas should be developed in the New York Region, it was confronted with a lack of standards of density and of use—not merely for residences, but for other structures that come in close proximity to residences. An attempt was made, therefore, to analyze the factors held by the courts to justify the employment of the police power in zoning. Our courts hold that the police power, as is well known, can be employed only to promote and protect health, safety, morals and the general welfare.

The first thing we did was to analyze the problem of density of occupancy—and, in particular, residential occupancy—with regard for these four factors.

The New York City Health Department figures showed some interesting contradictions. The sickness rate per thousand from such diseases as measles, mumps, chicken pox, diphtheria, scarlet fever, etc., was much less in the areas where the density was 200,000 persons per square mile than in districts where the density was much lower. Not only that, but the number of fatalities arising from motor vehicle accidents was much less proportionately in the congested areas. The pneumonia and tuberculosis rates showed similar divergencies. A closer study revealed that the East Side youngsters not only do not get hit so often by motor trucks, but, when they do get hit, do not die, to the same extent as others.

This prompted us to make further inquiry of the Health Department to ascertain the reason for this phenomenon. It appears that inherited resistance to disease, inherited stamina, and inherited vitality resulting from a long process of survival of the strongest under bad conditions in older civilizations have built up a high resistance, or immunity, in the people who have occupied the districts affected. Therefore, in any study of city-wide rates, there must be taken into consideration those factors of racial resistance that are found in certain districts.

DARK ROOMS AND TUBERCULOSIS

In Chicago in 1916 an effort was made by the Commissioner of Health to establish relationship between dark rooms and tuberculosis and similar

[1] Address before the Tenth National Conference on Housing, Philadelphia, June 28–30, 1929, published in *Housing Problems in America* (National Housing Assoc., 1929), pp. 125–33.

bronchial infections. Careful measurements of light intensities in several thousand rooms, correlated with the frequency of tuberculosis and other illnesses in those same rooms, failed to reveal what it was expected such comparisons would reveal. Health Commissioner Robertson said of this study:

So far as our figures are concerned, we can see no way to connect directly high records in the number of tuberculosis cases with high records in the number of interior rooms. No one likes dark rooms, and there seems to be no defense of them, but with the ideas that prevail about germ diseases, we cannot write them down as the chief cause in the spreading of disease.

In Detroit a few years ago Deputy Health Commissioner W. F. Walker prepared a series of charts showing the frequency of disease in the various sections of the city. These likewise failed to reveal the direct relationship that had been expected. Certain definite correlations were established, but these were not of primary importance.

Mr. Walker did make an important contribution, however. As a result of studying a number of cases where rickets had occurred in tenement building, he ascertained that the average intensity of light within the rooms in which rickets occurred was less than one-half of one per cent of the outside daylight intensity at the same time; whereas examinations of numerous other rooms of the same kind—in which light in excess of that average percentage was found—revealed an absence of rickets. No one can say, however, on the basis of Mr. Walker's examinations, that one-half of one per cent of the outside light intensity within a room is sufficient to prevent the development of rickets; but it is an indication that may have considerable significance.

HEALTH AND DENSITY OF POPULATION

Medical evidence has in the past generally asserted a correlation of health to density. A comparative study of figures from 71 cities in the United States brought out other interesting facts. Mortality rates were plotted against acreage of parks per 1000 persons, the mileage of water and sewer pipes per 1000 persons, and the area of acreage of parks and streets, and the mileage of streets, with these results:

Park area per 1000 persons apparently does not affect the mortality rate, for there is no indication that the mortality rate falls with increased park area.

There appears however to be a relation between mortality rates and sewer and water-pipe mileage. The mortality rate falls as the per capita mileage of water and sewer pipe increases.

The mortality rate falls as the total acreage of streets and parks increases, though it does not vary directly with the presence or absence of parks.

It seems fair to assume, therefore, that the distances separating buildings as shown by the ratios between mileage of water pipe, mileage of sewers, acres of streets and the mortality rate, do affect the mortality rate.

THE VALUE OF LIGHT

An examination made in 1924 and 1925 of a vast amount of medical literature brought out some interesting facts with respect to light. A preponderance of medical testimony with respect to the value of light establishes the following: that sunlight is one of the most effective bactericidal agents known; that sunlight carefully administered will not only cure rickets and surgical tuberculosis, but will prevent their occurrence; that sunlight is a great stimulus to health, causing chemical changes in the skin and blood and increasing cheerfulness; that the heat of the sun rather than its light is responsible for most of the ill effects noted from over exposure; that all sunlight acts as a tonic; that ordinary window glass filters out or excludes most of the beneficial short ultra-violet rays; but that the lower ranges of ultra-violet will pass through ordinary window glass and kill bacteria if sufficient exposure is given.

Some negative evidence with respect to the value of sunlight was discovered, but the great preponderance of medical testimony is on the side of its positive value.

Ventilation was studied to some extent, but the report of the New York State Commission on Ventilation was so conclusive that it was deemed unnecessary to go further. That report contains several statements of significance to this discussion. The first is, that early sanitarians overemphasized the importance of pure air and the harmful effects of carbon dioxide; that foul air however does affect the appetite and the work output; that it is overheated air which is really deleterious; that good room ventilation requires a temperature of 68 degrees, or less, without the production of chilling drafts.

Some examination was made as to the restful effects of grass, trees and shrubbery.

The best report on the relation of public morals to overcrowding was written by one of the justices of the municipal court of the city of New York, and published in full in a report of the State Commission on Housing and Regional Planning. This showed a direct relationship between

public morals and room overcrowding—a fact which is not news. It also showed a relationship between room overcrowding and land overcrowding, which is directly related to the problem of zoning.

The results of an examination of the number of cases of reportable infectious diseases by weeks in the city of New York over a period of eight years compared with the reported sunshine and recorded temperature in the city of New York during the same period indicates similar interesting correlations. The total number of reportable infectious diseases rises rapidly at the beginning of each year to a high point in February; and then usually falls off, reaching a low point about September 1st, and rising again in the autumn.

The amount of sunlight available is directly the reverse—low in January, rising to a high point in June and July and beginning to fall off in the autumn. As a matter of fact, there is a lag of about 30 to 45 days between the high point of sunlight and the lowest point in the disease curve, and a similar lag between the lowest point in the sunshine curve and the highest point in the morbidity curve.

The entire field was thus canvassed to determine what, if any, relationship exists between density of occupancy and health and welfare and zoning.

Out of all this mass of material, one fact stands out clearly, the value of light and of sunlight in particular.

How to get this valuable gift of Nature into our buildings is the question. Records of the Weather Bureau show that the United States is fortunate in the amount of sunlight available. In New York City over a period of 50 years, the sun shone 59 per cent of the time when it would have been possible for it to have cast a shadow. In Philadelphia the figure was 57 per cent of the time. Just east of New York, on Long Island, we have in the New York Region the high point of sunshine on the Atlantic Coast—78 per cent of possible sunshine, exceeded only by the area in the southwestern part of the United States, near Flagstaff, Arizona, and El Paso, Texas.

Detailed astronomical calculations were made to determine the length of shadow cast by buildings of various kinds, and the area of the sunlight upon the floor of the room through a given window of standard size for each 30-minute interval throughout the day. . . . . These studies show that it is possible to guarantee one-half hour of noon sunlight, or its equivalent in sunlight intensity, morning and afternoon, in every room

of every dwelling 25 feet square, without using more land than is customary in our usual subdivisions with lots 40 feet by 100.

PLANNING FOR SUNLIGHT

As a matter of fact, planning for sunlight, placing the buildings as close together as is possible but guaranteeing sunlight, results in an economy of land use—provided it is done with scientific accuracy. If you try shortcut rule of thumb methods, you will find that they take more land. The question of whether or not the labor involved in any given case is a saving, is determined by the cost of the land.

Different spacings of buildings result from different street orientations; and lot layouts must be very different from those to which we are accustomed. Sunlight planning will result in shallower lots with wider frontages. It necessitates a reconstruction of our ideas as to what constitutes a proper lot-unit, but the fact remains that it *is* possible to provide sunlight penetration in houses. At the time these studies were made, none of the glasses transmitting ultra-violet rays was on the market. To-day there are several.

Further studies were made with respect to the possibility of substituting skylight for direct sunlight or sunshine. Records of the Weather Bureau show that there is a great deal of ultra-violet intensity in skylight —more when the sun is low in the horizon—and it was established that for windows facing north, the window area should be increased about 50 per cent. Thus, for example, if we take as a standard a window 3 feet wide by 4½ feet high, we must increase to 4½ feet square the size of the window facing the north, in order to assure to it a skylight intensity over the whole day equivalent in ultra-violet rays to the standard window that gets direct sunshine.

This subject has aroused so much interest among planning boards in the New York Region that two communities in recent months have determined to amend their zoning ordinances so as to guarantee that the window area of every room shall equal 15 per cent of the floor area it serves. One community is going so far as to require, for every window in a business building, factory or residence, an unobstructed angle of light of 45 degrees from the zenith to the highest obstructing wall.

That, we feel, is progress.

SUMMARY

The housing problem may be divided into two parts: first, the securing of proper conditions of land development, control of surroundings, distribution of residential growth; second, the physical house. The latter is often considered the whole problem. The outstanding defects in houses are: (1) lack of light, (2) lack of ventilation, (3) lack of safety in case of fire, (4) poor planning and construction, and (5) high costs. Poor methods of subdividing property have provided lots too narrow and too deep for satisfactory house planning and for proper light and ventilation. Slums have developed in small sections of many large cities.

The poorest people never live in new houses. For this reason there should be sufficient numbers of new houses built annually in order to furnish space to allow for the demolishing of old houses unfit for habitation. The task is to see that houses built for more prosperous families are well planned and well constructed in order that they will, when old, be reasonably satisfactory for those who must occupy them. By setting a standard below which no dwelling may be erected the whole standard of housing gradually becomes higher. In every state of society there are persons unable to pay an economic rent for healthful housing accommodations. This is not a housing problem and should be remedied by charity and prevented by constructive social policy. When public aid is essential it should be given as a last resource and in a form that will assist rather than impede private enterprise. So long as old houses are required to be healthful there is no reason for disregarding economic conditions by forcing the erection of new ones for those who cannot afford them. Public authorities are responsible for demanding that old houses be kept in good habitable condition. When state or municipal aid is given it takes one of four forms: (1) granting loans at low rates of interest to individuals, public-utility societies, or municipalities; (2) granting outright subsidies to individuals or to others for the construction of houses having a certain standard; (3) direct state action providing houses for sale or rent; (4) exempting houses of a specified cost and character from taxation for a limited time.

Houses may contribute to ill health through (1) improper location of building on wet or poorly drained land, (2) fire risk, (3) unsafe and defective structures, (4) defective orientation, (5) excessive height of neighboring buildings which shut off light and air, (6) overcrowding in the same building, (7) land-overcrowding, (8) room congestion, (9) inadequate plumbing, (10) lack of or improper ventilation, (11) poor lighting, (12)

poor and inadequate equipment, (13) unhealthful location in an undesirable residential district. There appears to be a direct relationship between infant mortality rates and congestion and infant mortality rates and poor ventilation.

In analyzing health and housing factors racial resistance should be considered. A comparative study of figures of seventy-one cities showed a falling mortality rate with an increasing sewer and water-pipe mileage; also a falling mortality rate with an increasing acreage of streets and parks. The conclusion is that the distances separating buildings affect the mortality rate. The great preponderance of medical testimony shows the positive values of sunlight. Sixty-eight degrees or less is proper for room ventilation. Infectious diseases increase as the amount of sunshine decreases. From all evidence gathered the value of light and sunlight is of great importance. Studies show that it is possible to obtain a half-hour of noon sunlight or its equivalent in sunlight intensity in every room of every dwelling 25 feet square without using more land than is customary in usual subdivisions with lots 40 by 100 feet. Sunlight planning will result in shallower lots with wider frontages. Studies also show ultra-violet light in skylight. This should also affect window areas.

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CHAPTER XIX

IMPROVING HOUSING CONDITIONS THROUGH CITY PLANNING AND ZONING

ESSENTIAL FEATURES OF CITY PLANNING[1]

Although every city is adjusted somewhat to the topography or natural features of the land on which it is built, and to the convenience and needs of its citizens, the inhabitants of most cities heedlessly get themselves into all sorts of unnecessary tangles in their use of land. This happens because to no one is assigned the responsibility of looking around or ahead when a street is extended or cut off, or when blocks are built up one after another with no space left for parks and playgrounds. Streets are laid out in hilly districts with little or no regard for easy grades and low cost of construction and maintenance, or for economy in grading lots and building houses upon them. Ill-arranged blocks and sporadic dwellings on lowlands near the railroads stand in the way of expanding industries. River fronts, which are of the greatest worth to a city for parks or boulevards flanked by fine buildings are used for junk yards or for back yards which are little better in appearance, and ravines which would make ideal parks are used for ash dumps.

Good city planning aims to bring about order in the physical development of a city, town, or village. It brings the city government and its citizens together in preparing for their own future needs and for the probable requirements of their commerce and industries. A city or town is a place in which to live, to work, and to play, and should be planned systematically with these ends in mind, just as the location of buildings on a factory site is carefully determined.

In any community the local government, which means the organized citizenship, controls so much land in streets and public places, usually from 25 to 40 per cent of the total area, that it holds the key to the situation. Many communities double their population every 20 or 30 years, and the local authorities through their control of new developments, or lack of control, can largely determine for good or for bad the conditions that affect not only the present but coming generations.

[1] Adapted from *A City Planning Primer.* Division of Building and Housing, U.S. Department of Commerce, 1928.

In practically all cities in the United States large public and private investments are made each year in constructing buildings, streets, and public-utility lines and plants. Within 20 or 30 years the parts of cities now built up will probably have been largely rebuilt. Hence, carrying out a city plan does not usually start with bond issues to cover improvements on a grand scale. The city government simply allots its expenditures so that each improvement represents a part of a logical plan. Under a wisely drawn city plan, for example, the yearly street-paving work contributes toward a network of well-paved major streets instead of adding a series of unconnected units. In the case of new subdivisions, good planning assures that the new streets and improvements, made largely at the expense of the private developers, go in the right place.

City planning may be good or bad. It is good where it is based on a good plan and where public and private developments are in harmony with that plan. Bad planning is less often the result of a bad plan than of piecemeal planning, when the layout of a new subdivision, the location of a public building, and so on, are regarded as separate problems without regard to the layout of the city as a whole. There is always city planning going on in every town, be it good, bad, or incomplete. It is not possible, therefore, for a community ever to say truthfully that it is not interested in city planning.

WHAT IS A CITY PLAN?

A comprehensive city plan with its maps and notes lies at the foundation of every good city-planning program. Since orderly development is the objective, the plan must anticipate probable future needs of the community well in advance as well as record existing development. Preparing the plan, therefore, involves studies of the trend of growth in residential, business, and industrial uses of land and the most desirable directions for such growth. It should include a good zoning ordinance to minimize conflicting and mutually injurious uses of land. It is concerned vitally with movement of all types to and from the city and within it, and therefore deals with major thoroughfares; street railways; bus lines, and other forms of rapid transit; railways, waterways, and harbor developments; and public utility plants, mains, conduits, and wires.

All comprehensive city plans give a prominent place to recreational facilities, particularly parks, parkways, and playgrounds. Finally, the plan deals with the general location of public buildings of all types, including the city hall, schools, and fire and police stations. The main

features of the plan will ordinarily be stable, but it can and should be amended and developed as changing conditions demand. In a hundred different ways a city plan provides for better living conditions, better business, and a more attractive and agreeable city in which to live and do business.

FIG. 72.—*Before.* Conditions adjoining Main St., White Plains, N.Y., before construction of the Bronx River Parkway. (Courtesy of Planned Progress and Westchester County Park Commission, N.Y.)

HOW IS THE PLAN GIVEN EFFECT?

The plan is given effect by actions of both the city government and its citizens. Usually a city-planning commission is set up and given advisory powers, with general responsibility for seeing that the plan is prepared and carried out. With the commission's advice, the city council and the city departments are the agencies which actually authorize and construct streets and other public works, acquire parks and playgrounds, and locate and erect public buildings. The council must enact the zoning ordinance before it becomes effective and the executive branch enforces it. The planning commission itself is usually given some authority over the layout

of new streets in subdivisions. It also keeps the plan up to date and informs public-utility companies, business concerns, and private citizens of the principal features of the plan so that they may plan their utilization of land and construction in harmony with it.

FIG. 73.—*After*. The Bronx River Parkway, which is $16\frac{1}{2}$ miles long, has completely transformed the Bronx River Valley. (Courtesy of Planned Progress and Westchester County Park Commission, N.Y.)

PLANNING RESTS ON LEGAL BASIS

Every square foot of land within a municipality is impressed with legal qualities, which are often more lasting than pavements or buildings or other physical structures. Once a strip of land becomes dedicated to the public as a street or park it is likely to remain a street or park for centuries. Sites for schools and other public buildings, owned by the city, commonly long remain its property. Privately-owned land may receive a legal impress of more or less enduring character through limitations imposed by a zoning ordinance. The location of street railways, sewers, water-supply systems, gas and electric conduits, and overhead wires is based on legal sanctions.

The legal status given to land within a city forms the basis of a plan, whose value to the community depends mainly on the forethought that was used in the past in assigning legal qualities to land. Good and bad decisions become so embodied by force of law and by physical works that follow, that in many cases it is impracticable to alter them. Wise decisions now and in years to come depend mainly on proper planning, so that each step taken will be in accord with a consistent general scheme.

TRANSPORTATION

Transportation enters into practically every phase of city planning, and a thorough study of the present and prospective daily movements of people, motor vehicles, and goods must be undertaken before the other phases may be worked out in detail. The principal object of the street system, for example, is to provide for free movement of people and goods; parks and recreation facilities should be easily reached by those who use them. The zoning plan and the street plan are interdependent, for the traffic on streets varies materially with the use of land fronting on them. Certain parts of the city should be easily accessible to other parts, and to transportation terminals. The location of street railways, bus lines, railways, waterways, and their terminals is itself one of the most important planning problems.

THE STREET PLAN

The local government of a community controls the streets, which are its arteries. If they are adequate for present and prospective use they permit a free flow of the traffic, which is the community's life blood. If they are carelessly or inadequately laid out, they may, and frequently do, bring about serious and costly congestion.

A comprehensive plan furnishes a program for street changes and development, with the most urgent steps first on the list. It shows what land must be preserved for principal streets and how the opening of new streets will affect traffic elsewhere. It enables transportation companies and business men to place terminals and new buildings at strategic points, where the traffic can be efficiently handled. It aids in making parks and playgrounds accessible to those who want to use them.

GENERAL REQUIREMENTS FOR THE STREET SYSTEM

A system of wide, well-arranged thoroughfares is basic to good city planning. They should lead from the central part of the city to outlying

territory, and there should be belt streets affording direct travel between one section and another without passage through the central business district. Nothing preventable should be allowed to interfere with the choice of the best routes for the main arteries of travel. Without a city plan and the machinery to enforce it, a whole section of a city may be crippled, and inconveniences may be heaped on thousands of people for years to come, by a new residential development in which the blocks run the wrong way or the main streets are too narrow, or by the arbitrary location of a factory or a cemetery.

If some cities were permitted by the Federal Government to develop their harbors on the same principles that they use in developing their land, extension of piers and other obstructions would soon make their channels impassable. An automobile map of a modern city and its environs will disclose to anyone not already convinced by disturbing experiences the expensive delays now put upon both the passer-through and the town resident himself by a lack of wise foresight in planning in the past.

The determination of principal routes for present and prospective traffic permits a consistent scheme for city development to be laid out to accommodate industry, business, and residence. The streets and thoroughfares to be used most can then be improved easily within a few years by applying each year's appropriations for paving in the right places. Without planning, heavy traffic is often diverted to less direct routes, because of isolated sections of good or bad pavement, and such a diversion may break down the light pavements on streets that would normally be but little used.

THE APPROACHES TO THE CITY

Under modern conditions, a community may be approached by highway, by railroad, by watercourse, by airway, or by a combination of these four methods. Highway approaches are of enormous importance in these days of the automobile, and thought should be given as to whether roads shall lead only through the heart of the town or shall avoid congested districts by appropriate by-passes. Railroads are usually the basic means of contact between the city and the outside world. Their freight terminals, spurs, and sidings should be located and arranged for economical handling and trucking of the city's outgoing products, and of incoming food, merchandise, building materials, and raw products for industry. Passenger stations, or a single union station, if considered practicable, should be convenient and well served by local transit facilities. Property bordering the tracks should be well maintained and give a creditable impression of

the community to passengers entering and leaving. Water approaches may be made effective in serving commerce, and where that is not practicable, may be made invaluable in serving the health and pride of the community. The air approach involves landing fields, which, if properly provided and located, may be of great advantage.

THE CENTRAL BUSINESS AND SHOPPING DISTRICT

Free movement to the central business and shopping district concerns the entire community, the housewife, and the merchant alike. Certain businesses naturally seek locations in central districts, which are accessible to, and commonly visited by, persons from the entire city and surrounding territory. Such are central banks, large department stores, certain hotels and principal theaters, the offices of the local government, and certain specialty shops.

On account of the great numbers of people traveling to and within this area each day its sidewalks should be broad. Retail stores want traffic movement facilitated and traffic congestion diminished, to protect the safety and convenience of their customers and employees, and to reduce delays in the trucking of the goods they receive and deliver.

Conditions in the central business district can not be improved overnight. By-passing of through traffic around the business district has proved effective for relieving traffic congestion, but it may be necessary to extend "dead-end" streets or to separate cross traffic at main intersections by means of viaducts or subways. Grade crossings of railroad tracks may need to be eliminated, or new crossings constructed, or new bridges may be desirable. The necessity for such expensive undertakings in the future may be avoided or diminished by a well-considered city plan. Adequate provision for rapid transit should be made in the plans of communities which are approaching or which have arrived at the conditions justifying such facilities.

Some light manufacturing or other uses of property may derive little or no special advantage from being in the central business district and at the same time may make for its unprofitable congestion. Owners of such establishments may be encouraged to move elsewhere by being shown the advantages of more suitable locations and by a proper zoning ordinance operating over a period of years. Moving of terminals or shifting of the wholesale district is sometimes a practical way to lessen traffic difficulties.

WHOLESALE AND WAREHOUSE DISTRICTS

Wholesale and warehouse districts, under ideal conditions, should be located directly between the water or railroad terminals and the manufacturing or commercial area which they serve. Too frequently, however, trucking to and from the terminal may have to pass through the most crowded part of the central retail business district. This is neither economy nor common sense. A good city plan is a means of insuring against a repetition of mistakes.

INDUSTRIAL DISTRICTS

Heavy industrial plants usually require sites with railway sidings and, perhaps, a water front, yet convenient for employees to reach from their homes. In a well-planned city, residential development tends to leave such districts free and unbroken for use by industry. Light industries are more concerned with trucking facilities and with sites accessible to a large number of workers. A city gets along much better when homes and industry are kept separate but are at the same time easily accessible to each other.

PRODUCE MARKETS

The handling of perishable foodstuffs from their arrival in a city by freight car or truck to scattered retail stores is a very complex problem. If the distribution is prompt and efficient the people can obtain their food fresher and at lower prices. A well-planned wholesale market, accessible to cars from all railroads and to the trucks of local farmers, is usually the first item. It permits quick inspection of goods by buyers, and cheap handling and loading, without cartage delays. Up-to-date cold-storage facilities should be near by. In too many cities the produce markets grow up and are shifted about in a hit-and-miss fashion and are awkwardly arranged or become badly scattered. They are often so situated that the vehicles passing to and from them add unnecessarily to street traffic congestion. In many cases, indeed, the loading vehicles stand in public streets and practically shut off all other traffic.

LOCATION OF PUBLIC BUILDINGS—CIVIC CENTERS

The dignity and attractiveness of a community and the convenience of its citizens may be served by thoughtful location of public and semipublic buildings. These will ordinarily include the city hall, courthouse, public library, art museum, churches, high schools, and, perhaps, university

buildings. Each building of this type becomes more impressive when part of a well-arranged group, especially when it can be seen from long street approaches. But in such an arrangement special care should be taken to preserve a practicable street plan. In smaller communities the principal public buildings may form a single group, while in larger cities there may be a principal civic center, a principal educational and art center, and a number of outlying community centers.

RESIDENTIAL DISTRICTS

In most communities the district where the people dwell are far greater in area than those in which they work and do business. Different families have different desires in the way of homes. Most prefer to live in one-family houses on quiet streets, with grass and trees about them. Many families that can afford these advantages, more often those without children, still prefer to live in apartments, frequently to avoid personal responsibility for upkeep of the dwelling and to have easier access to the city center. Others assume this more cramped manner of living because of lack of houses for rent, the short term of their residence in one city, or other circumstances. The fact remains, too, that many existent dwellings in our cities do not conform to the standards of the single-family homes that most families would prefer.

Wise city planning can do much to make one-family houses available to more families. It encourages a better distribution of centers of employment, and thereby reduces the number of employees who must live near the business center. By providing an adequate, coördinate street system it reduces delays in transit and so makes wider areas for dwellings available within a given time for travel between home and work. Hence, the success with which the automobile enables city populations to spread out depends largely on good city planning.

While some broad avenues and wide streets are necessary to care for through traffic and to give access to a residential district, minor streets with narrow roadways and inexpensive pavements are adequate for the traffic serving the immediate neighborhood. A narrow paved roadway need not lessen the distance between the houses on the two sides of the street. It permits wider grass plots, and thus makes the streets more attractive. At the same time development of the land is cheaper and more families are enabled to own their homes.

Certain appurtenances go with every residential district. Neighborhood stores should be grouped at points convenient to all, but either they should

be off the main traffic highways or arrangements should be made through widening the roadways, or providing other parking spaces, so that they will not cause congestion of through traffic. The location of schools is even more important. When the school board can use a good city plan showing the probable character of development and the location of major streets it is better able to choose adequate school sites in new districts. The type of site usually desired will be convenient to the families that are expected to move into the neighborhood, and at the same time be off the main thoroughfares with their noise, confusion, and dangers from heavy traffic. Ample space is needed around schools for playgrounds as well as for light and air. It is therefore good business for the city to anticipate its needs while land values are still low and there is a good choice of large sites not yet built upon.

THE OUTSKIRTS OF THE CITY

Sparsely built-up territories, particularly those on the outskirts of the city, allow the best scope for good development as to streets, recreation spaces, and public improvements in accordance with a logical plan. Foresight in planning such districts is important not only for its inherent benefits to the new localities, but for the convenience of all who pass through them, and for its effect on conditions at the center of the city.

PARKS AND PLAYGROUNDS

Adequate recreation space, although often overlooked, is of great importance to a community, and provision for it rightly belongs in a good plan. A lawn around the home is the best place for very small children to play, but public playgrounds and athletic fields are needed for organized games for larger children and adults. The increasing dangers imposed by rapidly moving traffic further emphasize the hazard of streets as play space, and the need for enough well-located playgrounds to care for every child. The distance that children of various ages will customarily travel to playgrounds should, of course, be recognized, especially in apartment-house neighborhoods, where even the smallest children must be provided for. The need of more public open spaces of all kinds is one of the consequences of apartment-house living and must be borne in mind as apartment-house areas develop.

A great country park, desirable as it is, is now generally recognized as a supplement to, not a substitute for, smaller parks convenient to the people who need ready access to trees, grass, and open space. Thus all

the breathing spaces for fresh air and sunshine provided by recreation space are an integral part of a city plan. Adoption of a park and playground program frequently results in the donation of land for park purposes by public-spirited citizens, or by landowners who discern the advantage thus obtainable for their adjoining subdivisions.

Public recreation facilities are as important to the village as to the large city. Many a farm community has no public parks or playgrounds; hence the children must be trespassers to play, and adult athletic contests are hampered by inadequate, makeshift facilities. Good playgrounds and athletic fields lead to better physical development and a spirit of team play, while every form of wholesome recreation for adults helps to check unwise movement of population to large cities.

CARRYING OUT THE CITY PLAN

The preparation of a good city plan requires skillful handling of details, clear vision into the future, good judgment in deciding what is practicable, and a spirit of fair play in adjusting interests that may appear to conflict. Once formulated, the plan needs to be kept up to date, and its execution is never completed while the city is growing or rebuilding. Placing the general responsibility in the hands of a continuing body of well-informed, influential men is the best means so far devised for securing efficiency in city planning. Carrying out the plan often requires courage on the part of the city government, for free departures from it may result in promoting just such disorder and uncertainty as it is designed to prevent. Its integrity can be assured only by a strong and continuing public opinion, and this is best maintained by having leading men in the community at the head of the work.

CITY PLANNING COMMISSION AND ITS WORK

A separately organized city planning commission is usually the best agency for assuming the general responsibility for preparing the plan and to aid the city government and private individuals in carrying out its essential feature. Such a commission usually consists of from 5 to 11 members. It may include the mayor, the city engineer, a representative of the city council or similar body, and prominent citizens serving without pay. The citizen members should always be in a majority. It should be authorized by the city council to expend funds for preparing a plan, and to call on all municipal officials, including the city engineer, the city attorney, and others, for advice and data. The city council, in turn, ordinarily

derives its power to grant such authority from an enabling act passed by the state legislature. Such acts are already in effect in many states, and a standard act with full notes to explain its provisions has been prepared by the Department of Commerce advisory committee on city planning and zoning, to serve as a guide to those preparing such legislation.

Where such authority has not been granted, unofficial commissions, sometimes appointed by the mayor, or sometimes representing unofficial civic bodies, may be organized, and often accomplish a great deal, particularly if they succeed in raising private funds for preparing a plan. Such a plan may be followed in many features by the city government.

Practical results are much more readily attained when the commission has official advisory powers.

The official city planning commission, however, should not be charged with executive functions, such as the administration of the park system or some of the usual construction or administrative functions of the city. Past experience indicates that such duties are better left in the hands of regular executive departments and administrative boards.

Since the city planning commission's final responsibility is to see that a good city plan is carried out, one of its functions is to determine how the city's financial resources and expenditures may best provide for its planning needs.

CITY PLANNING AND HOUSING[1]

By HAROLD S. BUTTENHEIM

Editor, *American City*

At the outset of this discussion, two definitions are needed. The term city planning will be used as covering the selection and use of land for public purposes in urban areas and control by the public in such areas of the use of private land. Housing will be used in its obvious sense of structures designed or used for human habitation.

As thus defined, where do city planning and housing meet?

1. *They meet in the zoning ordinance and the building code.*—Under the definitions just given, zoning may be regarded as a subdivision of city planning, and the building code as an important factor in good housing; or perhaps we might more accurately give to zoning ordinances and build-

[1] Adapted from "Where City Planning and Housing Meet," *Planning Problems of Town, City and Region, Papers and Discussions* (New York: National Conference on City Planning, 1929), pp. 114–21. Address before the Twenty-first Conference on City Planning, Buffalo, May, 1929.

ing codes the appointment as chief liaison officers between the city planning and housing forces.

The job of these liaison officers, of course, is to protect and control as effectively as may be, in the public interest, the proper use and development of private property. We need somehow to give them greater sanction than they now possess in many cities, and to warn our public officials and civic organizations against the too common American mistake of passing a law and assuming the job to be done. Careless building inspectors and complacent boards of adjustment are all too numerous in cities where lawmaking is regarded as more important than law-observance.

2. *City planning and housing meet in the street.*—And the street in its location and width is one of the most nearly permanent of human products. . . . .

If we can ever induce our public officials to give as much forethought to placing new streets properly on the map as they are now compelled to give to correcting previous mistakes in this matter of street location and width, we shall have done much for the cause of city planning and housing. . . . . Among the ill effects on housing of this state of affairs—against which painfully slow progress is being made by our more progressive city planners and municipal engineers—are:

a) Needlessly high cost for land, because of wasteful street layout, involving greater installation of paving and utilities than scientific planning would justify.

b) Failure so to orient the streets as to provide the maximum of direct sunlight to dwelling rooms.

c) Back yards that are either too small or too deep for efficient use.

d) More corner lots than needed, in residential districts, involving betterment assessments, street noises, traffic dangers and dust on two sides, where one front—or no front—on a motor highway would suffice.

3. *City planning and housing meet in the multi-family dwelling.*—In the new buildings now being erected in many of our larger cities, more families are being provided for in "apartment houses," so-called, than in single-family homes. The good old term "tenement house" has gone into the discard, except in legal documents. But while the multi-family dwellings now being erected are in general more fit for human habitation than the worst of the old tenement houses, most of these new buildings occupy, as Henry Wright, John Taylor Boyd, Jr., and others have shown, a needlessly large percentage of their lot area.

Our ears are being constantly battered these days with the half-truth

that mankind cannot be made virtuous by law. The extent to which *words* can be made virtuous by law, I do not know; but if we could enact legislation which would restrict the use of the term "apartment house" to buildings occupying not more than 50 per cent of their lot area, and compel the use of "tenement house" in the name and in all advertisements of dwellings of the more congested type, we should go far, I am sure, to cure our speculative builders of their appetite for super-congestion.

4. *City planning and housing meet in the onward march of business and industry.*—The "blighted district" is the outward and visible sign of this unwholesome contact. No one wants business and industry to remain static; but a great handicap to the orderly development of most communities is that too much space, rather than too little, is provided for purposes of manufacture and trade. We have the spectacle of our small town Main Streets spoiled for a mile in length as sites for pleasant homes by straggling and struggling retail stores. The zoner or realtor who provides soil for two such stores to grow where only one is needed, is far from being as great a public benefactor as he would be, could he devise a method of restricting business property to the reasonable needs of the community without creating a form of land monopoly which would be to the community's detriment.

As to factory sites, let us have them by all means—in communities that want them. But let us stop providing any *unrestricted* districts in our zoning ordinances. If there is logic in excluding the so-called nuisance industries from other districts, why should we not exclude all housing from districts where nuisance industries are allowed? There is as yet altogether too much truth in the criticism which certain radicals make of some of our zoning ordinances—that they are devised with tender solicitude for upper economic groups of the community, but are far from providing adequate open spaces, sunlight, and freedom from noise and atmospheric pollution, in the districts where those of the "other half" live. If it be argued that congestion is necessary because of high land values, let it not be forgotten that one cause of high land values is this very fact that congestion is permitted—to the financial gain of a few and the detriment of the many.

5. *City planning and housing meet—or should meet—in the clearance of slum areas.*—On this important phase of the subject under discussion, I cannot do better than quote from an able article by one of our foremost authorities on housing, Dr. Edith Elmer Wood, which the *American City* is to have the privilege of publishing in an early issue.

Mrs. Wood lists four main causes of slums: (*a*) faulty layout—too narrow streets or too large blocks, inviting courts, alleys and rear tenements; (*b*) bad structural plans of the dwellings themselves; (*c*) disrepair; and (*d*) overcrowding and uncleanliness. While placing on landlords and tenants, rather than on city planners, responsibility for (*c*) and (*d*), ...[1]

6. *City planning and housing meet in laws and practices relating to real estate, taxation, assessment and eminent domain.*—The painter achieves success when his beautiful dream becomes a picture; but the city planner or architect achieves success only when his beautiful picture becomes a street or a park or a building. The manufacturer succeeds when he designs a worth-while product and makes it and *sells* it. For some reason, however—or for many reasons—ability to transform city plans into a living reality lags far behind ability to conceive them. Discussing the economic phase of this subject before a 1927 meeting of the Snag Club, in New York, Dr. Charles A. Beard said:

> It will be conceded that the power of artists and engineers to conceive city plans and the capacity of technical experts, contractors, and laborers to carry them into execution is without discernible limits. Equally undeniable is the proposition that, considered from the standpoint of esthetics, economic efficiency, and physical comfort, our great cities must be assigned a low scale in the percentage of possibility. There is hardly a municipality of any size in the country that does not have filed in its libraries and its city hall innumerable dust-covered rolls of blueprints and projects, drawn by competent hands, indicating lines of constructive work which would add enormously to the productivity and comfort of its inhabitants. Apart from decorative work, such as boulevards making it easy for the Rotary boys to go from their offices to their country clubs, or civic plazas—that is, putting diamond crowns upon leprous brows—there has been very little achievement in the field of city planning in the United States. Our capacity for execution, for realization, has lagged far behind our capacity to imagine and to project. Why is this so? Surely there is no more interesting problem in social economy than this—none worthier of the highest talent we can discover.

We need, obviously, more efficient governmental machinery and community organization for carrying out our city plans. Fully as important, I believe, is the practical problem of acquiring the land and financing the improvement thereof or thereon. We can never reach absolute justice in so financing our public improvements that those who benefit from them will pay in exact proportion to benefits received. An approach by gradual

[1] See pp. 660–65.

steps to land value taxation, however, and a wider and more scientific use of the special assessment method of financing street, transit and park improvements will go far towards effecting a righteous and productive union of city planning and housing.

One of the most heartening signs of the times is the advocacy by the National Association of Real Estate Boards of the principle of excess condemnation (or marginal eminent domain, as it might better be called). And now if the same Association will use its great influence in behalf of laws by which private property needed for slum clearance and model housing projects can be secured at a fair price, it will perform a public service of great importance.

7. *City planning and housing meet in many other times and places.*—To describe them all in detail would greatly exceed the limits assigned to this paper. . . . . These other times and places, some of which have had incidental mention in the foregoing paragraphs, include:

a) When a conflagration rages which scientific city planning might have prevented.

b) When the prevailing winds blow and prove that certain housing and factory districts ought to have been transposed.

c) When ordinary traffic highways are laid out where parkways ought to have been planned.

d) In the selection of sites for future schools.

e) In the layout of mill villages and other industrial housing enterprises.

f) In the activities, good and bad, of real-estate subdividers.

g) In the city's transit system.

h) In the new movement for architectural control.

8. *Finally, city planning and housing meet in their social objective.*—This social objective in the case of zoning has been admirably stated by Alfred Bettman, as being "always positive and constructive and not merely negative and preventive." And I want to supplement my own earlier definitions by describing *intelligent* city *planning* as the application of imagination, skill and justice to the layout and public control of the development of urban areas; and *intelligent housing* as the application of these same factors to the design and building of structures fit for human habitation. . . . . May we not anticipate, for example, a friendly rivalry among the wealthy and public-spirited citizens of each of the forty-eight states in the building of the best-planned town for the motor age, and similar rivalry in all large cities in the development of low-cost garden homes for

wage earners? The result would be a stimulus to city planning and housing progress whose benefits in human welfare and happiness would last as long as the world shall endure.

CITY PLANNING AND THE STANDARD CITY PLANNING ENABLING ACT[1]

By LESTER G. CHASE

. . . . There are 31 states, the District of Columbia and the Territory of Hawaii that have laws in effect that authorize planning in cities, towns, boroughs, counties and regions.[2] These laws are grouped in two classes, those that may be termed general enabling acts, as they authorize planning in all cities, or cities of a certain class, towns, boroughs, villages, counties or regions, of the state; and those that may be called special acts in that they affect only certain named cities or areas. . . .

CITY PLANNING COMMISSIONS IN THE UNITED STATES

Under the authority conferred by these general and special planning laws, planning commissions have been established in cities, towns and villages of many states. In other states commissions have been established by municipal charter amendments under home-rule provisions of state constitutions or laws, and in other cases commissions have been appointed without specific authorization by the state. Depending upon the authority for their appointment, the powers and duties of the commissions, and the extent to which the municipal legislative body must take cognizance of their recommendations, planning commissions are commonly classified as official or unofficial. A commission established in accordance with the terms of a state enabling act or a city ordinance or by-law adopted by the legislative body of the municipality is termed an official commission, while other groups such as those appointed informally by the mayor or other administrative official as an advisory committee, or those representing local civic organizations or chambers of commerce and acting only in an advisory capacity with no legal authority to carry out their recommendations, are classified as unofficial commissions or committees. . . .

[1] Adapted from *Survey of City Planning and Related Laws in 1929* (mimeographed circular). Division of Building and Housing, U.S. Department of Commerce.

[2] [*Progress in planning.*—The number of states which have enacted planning legislation and also the number of city-planning commissions in the United States may be obtained from the Division of Building and Housing, U.S. Department of Commerce.]

THE STANDARD CITY PLANNING ENABLING ACT

In March, 1927, the Advisory Committee on City Planning and Zoning, of the Department of Commerce, after an exhaustive study, published a Standard City Planning Enabling Act. The purpose of the Committee in preparing this act was to make available, for the information and use of those engaged in drafting planning laws, a guide, the provisions of which represent extensive investigation into the various features of planning legislation, and the text of which supplies a model from which the states may frame and develop planning legislation.

In the text of the act the four general subjects are covered which experience has shown to be a necessary part of planning legislation. These are: (1) the making of the city plan and the organization and powers of the city planning commissions; (2) control of the layout of new subdivisions; (3) control of buildings in the bed of mapped streets; and (4) the regional plan and organization of the regional planning commission. The act contemplates a grant of authority by the state to municipalities and regions to avail themselves of the powers therein conferred. It is a permissive act and does not impose the creation of planning commissions upon muncipalities or regions, but leaves it optional with them, offering the opportunity to create such commissions if they deem it desirable.

Regarding the planning commission the Standard Act provides for the creation of a body so constituted as to take a long-range view of the development of the municipality. It contemplates a commission of nine members, six of whom shall hold no other municipal office, being thus free from the pressure of current municipal problems. Overlapping terms of six years, much longer than the terms of other city officials, including council, are provided for, one vacancy occurring each year. This insures first, that the city administration during a single term shall be unable to appoint a majority of the members, and second, that eventually the membership will represent planning experience of at least from one to five years, a desirable background for comprehensive planning.

The act provides that it shall be the function of the planning commission to prepare and adopt a master plan for the physical development of the municipality and adjacent areas. The matters to be covered by such a master plan may include streets, other types of public grounds, public utilities and zoning. The adoption of the master plan rests with the commission; it does not require submission to or approval by the council.

After the commission shall have adopted the master plan or one or more of its major sections, future public improvement such as streets, squares, parks, public utilities, etc., may not be authorized or carried out until their location, character and extent have been submitted to the planning commission and their relation to the city plan carefully studied. If approved by the commission the council's approval may be by affirmative vote as required by the general law; if, however, these improvements are disapproved by the planning commission, the council still has power to overrule such disapproval, but only by a recorded vote of not less than two-thirds of its entire membership.

From these provisions it will be seen that any improvement project coming before the council must, if it involves planning problems, be submitted to the planning commission for study and approval or disapproval, but the council retains its essential legislative power, that is, the power to make the final decision.

The adoption of the original master plan is the primary function of the planning commission; it does not require submission to or approval by council. The commission, unhampered by other municipal problems, is especially competent to do this in view of its knowledge of the needs of the city and the probable trend of its future growth. Its long-term membership, its authority to contract with city planners, engineers, architects and other consultants for such services as may be required, as authorized by the act, and its coöperation with the city engineer or other municipal officials, render the commission better qualified to make and adopt the original master plan than the legislative body of the municipality, whose duties, as previously stated, are of a more immediate and pressing nature.

HOUSING AND THE REGIONAL PLAN[1]

By JOHN IHLDER

Executive Director, Pittsburgh Housing Association

The great American novel, of whose coming we used to talk a great deal, has not been written and probably never will be, for a novel must have location, must picture with fidelity to detail individual characters and a group of characters. This necessary detail inevitably makes it sectional, provincial, differentiates its people and its atmosphere from the people and the atmosphere pictured in another novel equally good, equally

[1] Adapted from "Housing and the Regional Plan," *Proceedings of the American Society of Civil Engineers*, Part I (1927), pp. 1513–23. Paper presented at the joint meeting of the City Planning Division with the American City Planning Institute, Philadelphia, 1926.

true, the scene of which is laid in another part of the country or which deals with a different group of people. These differences will cause Americans of other sections to disclaim both books as representative of America as they know it, though to foreigners who view us from a distance both books may seem typically American. We, close at hand, see most clearly the differences of detail, accept subconsciously the likenesses; they, farther away, miss the detail and see only the broad likenesses.

So it must be with our regional planning and the housing that is to develop as regional planning becomes accepted practice. The broad likeness that will be characteristic of our regional plans and the housing for which they provide will lie in acceptance of the proposition that they shall provide adequately, even generously, in terms of open spaces, of sanitary equipment, of "modern" conveniences; that they shall be based upon the well-known but, fortunately, never clearly defined "American standard of living"; "fortunately" because this standard is ever changing, ever rising. Other nations may accept present standards, seeking merely to modify them so that they may be tolerable; other nations may figure closely on economies which they believe the hard conditions of their life force upon them—definitely discard, for example, water-borne sewage and a sewer system, not only because of cost of installation and operation, but also because of loss of fertilizing content which they believe they must have for their farms. But we, who are coming to reckon farm productivity in terms of bushels per man while they reckon in terms of bushels per acre, will base our plans upon the health, efficiency and more abundant living of our population rather than upon the amount of money *not* spent for a sewer system or an imported or manufactured fertilizer. Water carriage of sewage may go into the discard, but not until we have found a better method of safeguarding human well-being.

Inside such broad American characterization, however, our regional plans will doubtless take on many differentiating characteristics due to sectional habits, traditions, resources and climate. Consequently, in a paper like this, dealing with the subject for the whole nation, one must paint in broad strokes, describe objectives in general terms that are subject to infinite modification in their detailed application, give approximations rather than exact measurements.

A house is not a commodity of uniform size and character, as a pound of sugar has been since the pure-food law was enacted. Its variations are infinite, though they all fall into fairly clearly defined classifications. The

use of each of these classifications will be affected by the regional plan if that plan proves effective in guiding metropolitan or regional development. Consequently an outline of a regional plan from the housing point of view is necessary if housing is later to be fitted into it understandably.

REGIONAL PLAN OUTLINE

The metropolitan region may roughly be defined as the area within commuting distance of the central or mother city. It may be an area about one or two cities of small or medium size as well as that about a large city. It may at present contain only one or two units of really urban character, the rest of the region being residential suburban. But if it does not have other urban units now, it will acquire them later as population increases and neighborhood business districts develop. Moreover in this day, when every chamber of commerce is seeking factories and when factory managements are thinking in terms of industrial distribution, it is almost inevitable that the metropolitan region outside the mother city will develop industrial districts. Consequently, provision must be made in the regional plan for both industrial areas and commercial areas in addition to residential areas. These, normally, will grow into separate towns. And, unless preventive measures are taken, they ultimately will merge into one great city, as Philadelphia and its satellites have done.

Philadelphia has developed much as the regional planner would have a city develop, except that adequate provision was not made for traffic and except that the separate communities were not kept separate by adequate intervening open spaces. The original city of Philadelphia with its mill satellites, Kensington and Manayunk; its factory satellites, Nicetown and Tacony; its residential satellites, Germantown and Chestnut Hill, if each were separated from the others by open areas, if the brook valleys had been preserved instead of being filled up to make uncertain sites for the foundations of buildings, would be a pleasanter city than it is with its interminable streets filled with monotonous rows of houses. . . . .

HOW URBAN UNITS ARE TO BE SEPARATED

The metropolitan region of the future therefore will be planned to contain a number of distinct urban communities which will be enabled to preserve their individuality by surrounding open areas. In part these will consist of parks, some formal such as Fairmount Park which today separates Philadelphia from the main-line towns, some natural parks or forest reserves such as those Boston, Chicago and other cities are acquiring. But

park land alone will not be enough. So much open space is required for the proper ventilation of our cities that a considerable part of it must be devoted to productive uses that will pay its way. Cities like New York and its New Jersey neighbors, and the great congeries of cities that are growing up about San Francisco Bay, have been blessed, largely against their wills, by open water spaces that seem to some of their bustling citizens far larger than is required—just as some of our cities in the past thought some of their streets too wide, only to find to-day that they are not wide enough. It would be difficult to overestimate the economic value of the breezes from the water that blow through the streets of New York and the Bay cities.

Awakening to the advantages which nature forced upon our fortunate members, we shall provide adequately for the new kind of harbor that is coming to us with the airplane. We doubtless shall, under stress of necessity, figure carefully how small an air field may be, how high the surrounding buildings may be permitted to rise, for we wish to bring the air harbor as far in town as possible in order to minimize change in existing values. But as the railroad induced our river towns to turn their backs upon the levees, so the airplane may induce them to face in a new direction, and those towns which make the most adequate provision are likely to reap a benefit.

But air harbors like water harbors will prove inadequate to our purpose and other uses, such as truck gardening and farming, will be found for these open areas.

HOW URBAN UNITS ARE TO BE CONNECTED

Isolation, however, is not an objective in the regional plan. Each of the urban units in the region must be readily accessible from the others, more accessible than is the upper east side of New York from Riverside Drive. Water routes, rail routes, air routes, and main or arterial highways will be carefully planned so that each center in the region may be easily and quicky reached from every other center. When it is remembered that by very far the greatest amount of daily travel by an urban population is between home and place of employment, and when it is remembered that in such cities as New York or Chicago with their overgrown central business districts, where vocations that have no possible direct connection are jumbled together and the working population must twice daily pass thousands of buildings that have no possible part in their lives, the waste of time, effort, money, becomes obvious. Though like businesses

instinctively tend to group themselves, the financial and administrative interests in one group, the dry-goods wholesalers, the jewelers, the leather men, in other groups, and thereby simplify their transport problem *after* their workers have arrived for the day's work, these workers still waste much time every morning and evening by passing the buildings of other groups and the dwellings that house the employes of these other groups. The regional plan will reduce this waste by segregating vocational groups more effectively and will bring the homes and workshops of each group closer together.

The need of occasional intercourse between representatives of different groups will be met by express routes, rail and highway—perhaps in the near future, air—between the urban centers in the region.

The housing value here is that the better segregation of vocations, which we can secure by intelligent regional planning and zoning, instead of by depending upon the blind instinct which has guided us up to the present, will bring home and work closer together and in smaller urban units. As a result not only will time of travel—to-day worse than wasted because of crowded cars that sap the rider's strength and vitality—be reduced, but, because more space will be available, the character of the dwelling may be improved.

TRANSIT ROUTES AS DISTRICT BOUNDARIES

The transit routes that tie the urban centers of the region together will in large part form the boundaries of residential districts. Along parts of these routes, especially at the intersections of arterial highways, will be minor or neighborhood business districts, containing neighborhood stores, banks, moving-picture theaters. Within the space they found will be a residential area large enough to support one or more schools, playgrounds, small neighborhood parks, a branch library, a community center, churches, so that children at least will have small occasion to cross the busy main traffic streets.

These main traffic streets or arterial highways are one of the most interesting of the problems that confront regional planners. Their primary function is to carry traffic from center to center within the region or to more distant destinations. How they should be designed, what width should be secured for rights-of-way to provide against future needs, whether they should contain facilities for rail as well as for road vehicles, are questions outside the scope of this paper. But it is necessary to point out that they will carry not only a heavy volume of traffic, in some cases

a constant stream of traffic by day and a considerable and increasing amount of traffic by night, but that they will carry heavy vehicles. The increasing weight of trucks and busses has become a matter of public concern. Admitting, what seems to be the fact, that the large truck and bus make for economy of operation for their owners, they at present cause great expense to the community as a whole and to property owners along many of their routes where they are permitted to range at will. Street paving that would carry passenger cars for years goes to pieces quickly under their pounding, which also cracks the walls of dwelling houses and which, together with their noise, seriously depreciate the value of whole residence districts. The main arterial highways apparently must be designed and built to carry such vehicles, which will some day be excluded from residential streets. But what concerns us here is . . . . the proper development of the abutting land.

We used to have a theory that every street-car street was potentially a business street. It was a poor theory, based upon inadequate experience. But inadequate as the basis always was it is becoming every day less adequate. Not only are our merchants realizing that the string business district can not compare with the compact district, not only are busses that operate on parallel streets applying the same argument to those parallel streets, but we are learning that business could never occupy all the frontage on street-car streets. Recent studies have indicated that, outside the principal downtown shopping district, not more than five per cent of an area will be occupied by business.

If this is borne out by further studies, it means that the frontage on the main arterial highways of the region must in very large part be devoted to other than business uses. Attempts to develop such frontages as residential are not proving permanently successful, even when the residences are multi-family houses. The inhabitants of multi-family houses object less to noise and movement than do those of one-family houses, but even they are beginning to find that noise and movement can be increased to such a degree as to become intolerable. So while we may zone the non-business frontage of these arteries for multi-family house occupancy, we shall have to give even such dwellings protection if they are not to be blighted. The suggestion I offer is that in addition to the ample right-of-way for traffic purposes the community shall take possession of strips on either side of the traffic artery. These strips should be parked, and behind on either side should be a minor street serving the dwellings. The dwellings themselves should then be set back. This will provide for two screens

of planting between the dwellings and the traffic highway. The park strip might be so wide that when, as and if business expansion can utilize it in part, it will provide suitable sites for business buildings.

This may seem extravagant but my belief is that it will prove less costly than the slow and spotty development of property abutting directly upon a main traffic highway and the inevitable depreciation of such dwellings as may be there erected.

CITY FACILITIES AND NEIGHBORHOOD FACILITIES

Housing cannot be considered adequately apart from facilities offered by the city or community and their accessibility. To the wage earner distance from place of employment translated into terms of money for means of transit and time or effort is of greater importance than to those whose means are greater and hours of work are shorter, though to everyone the waste involved in needless distance covered daily is an economic loss of moment unless it can be transformed into a strength-giving or health-giving or inspiration-giving factor. . . . .

By and large the best means of transit yet invented is that one, reminiscent of days before the horseless carriage, known as shanks mare. For the normal man a half-hour's walk, especially if it can be along a pleasant route, is a good prelude to a day of sedentary or indoor labor. Next perhaps comes the bicycle, for this too involves exercise. Then come vehicles that run upon the surface of the earth, that give their occupants the benefit of sun and air. Last comes that means of transit which takes him underground. As the old-fashioned outside iron fire-escape, now happily tending to disappear, was a confession of our failure to construct our buildings properly, so the subway is a confession of our failure to construct our cities properly. There is room enough in the United States for all of us to live above the surface of the earth. Such failures, forcing us to patronize crowded vehicles or sub-surface vehicles, have a direct effect upon housing by giving us the choice of two evils, these means of transit or an inferior type of dwelling nearer to our place of employment.

While access to place of employment is usually the chief consideration, access to schools, to places of recreation—theater, opera, amusement parks, golf or tennis grounds—are of some importance. These merge into facilities offered by the neighborhood, which is the area that, ideally, lies between main traffic streets and all parts of which are within easy walking distance of home even when home is part of a district of widely-spaced, garden-surrounded, one-family houses. Here will be the grade schools

and the playgrounds for small children, perhaps a high school or at least a junior high for the older children, a library or a community center and a neighborhood playground for adults, and churches—set in grounds large enough to permit their expansion without violating the area provisions of the zoning code. Most church congregations seem to be pessimistic of their future, yet instances are known where churches have had occasion to expand and their officers then felt no hesitation in asking that a rule made for the benefit of the community and the protection of their neighbors should be suspended in order that they might escape the penalty of lack of foresight or lack of faith.

Within the region and its units, thus broadly outlined, our problem is to fit our housing so as to give the people of urban America the greatest possible facilities for living abundantly.

A FEW ASSUMPTIONS

1. It is desirable to decrease the speculative elements in housing and to increase the investment element until the first has been reduced to the vanishing point and the latter has become controlling. This means that we should stabilize values, and stabilization of house values is dependent upon stabilizing the character of the neighborhood. In this stabilization regional planning, supplemented by zoning, is essential.

Admitting the great part that speculation has played in producing the dwellings of America, we must also admit that it has played as great a part in destroying them, in blighting whole sections of our cities, in promoting rapid transition which lowers housing values so quickly that the investor has withdrawn from a large part of the market—leaving it to the "home-owner" whose controlling motive is sentiment, in deteriorating construction until the buildings erected to-day have a much shorter expectation of life, a far higher expectation of repair and maintenance costs than those of our fathers and grandfathers, and, most important, in leading us to accept dwellings inferior in type. From the one-family house which used to be universal it has led us to the multi-family house and has gradually squeezed and cramped this lower form of dwelling until a large and increasing part of our urban population lives in one-, two-, and three-room apartments. These multi-family dwellings are popularly supposed to have investment value, but experience is showing that by and large the rapid obsolescence of a multi-family house prevents its being in the class of gilt-edged bonds. From the social point of view its destructive effect upon family life is a matter of concern.

2. The preservation of the family—meaning parents *and* children—is essential. The population of voting age may be everything that candidates for public office tell its members that they are, but its life and its work would lose significance if there were no children to carry on. With the children lies the

FIG. 74 (courtesy of the *New York Evening Post*)

whole future. Consequently, children are of first importance. And since the house is the shell in which the family functions, since it exerts a constant influence in molding and shaping the family, even in determining whether or not there shall be children, the question of housing should be approached from the point of view of the well-being of children.

3. The one-family house with generous open spaces about it is the best house for a child. Consequently, every effort should be made to promote the erection, to protect the continued existence of such houses.
4. While the one-family house is the most important type of dwelling, there is a legitimate demand for other types ranging from the two-family house through the so-called multi-family house and the apartment-hotel to the hotel. This demand must be met, but because these socially inferior types of dwellings with their possibilities of land overcrowding and cramped living quarters can underlive the one-family house and drive it out, just as Oriental labor can underlive and drive out white labor, it must be restricted to certain specified sections of the community and must be strictly regulated so that it will provide the essentials of wholesome living—light, air, room-space, sanitation—for its inhabitants.

CLASSIFICATION OF URBAN POPULATION

In urban communities there are several easily recognized groups for each of which housing provision should be made. First and much the most important, because with them lies the future, are the families with children or expectation of children. They call for first consideration. They themselves may be divided into two classes. First are those who are fairly permanently located in the community, whose interests and fortunes have been and will be bound up with those of their neighbors and fellow citizens. They are the most valuable element for they have developed or can develop a lively sense of community responsibility. Less valuable, but more in need of assistance, is the second class, composed of families which, because of the nature of the bread-winner's work or because of the temperament of father or mother, frequently move from city to city. They range from high salaried officials of large corporations, army and navy officers, professional men and women—civil engineers, social workers—to the automobile tramps who have become an interesting and puzzling phenomenon of modern life, whose younger children have never known a more stable home than the "flivver" and whose importunities are increasing the burden carried by charity organizations. Even those among this second class who are best placed economically have a difficult problem in providing homes for their children in these days when the choice lies between buying a proper house or renting an apartment.

In the first group it will be noted that families with "expectation of children" have been included as well as those with children. There is a great deal of talk about giving the young married couple a shelter that will just fit their present needs, assuming that when the expected happens

they will move from their furnished two-room flat to that idyllic vine-covered cottage where love traditionally abides. Considered as a matter of pure economics, there is much to be said for all this, but while sound economics should be the foundation of living, pure economics is a sterile soil which will not produce an adequate crop of babies. Marriage, the family, is an adventure. Reason it out too coldly, balance economic items too carefully, and the young couple will grow to middle age, still living in their apartment, still thinking first of their own safety, their own comforts. Then the Nation may well ask why it was taxed to provide for their schooling, to protect their health, when they have been unwilling to pass on the heritage they received. The first home of the young couple should be at least a promise of its future home, should have in it the room, the play yard that every day ask when the expected is to arrive. This may be economic waste, but the greater part of the joy of living consists of what cannot be strictly justified on the score of pure economics; it may be beyond the means of many young married couples, but it is an objective to be approximated as closely as we—and they—can.

Next to be considered, because they have not shirked but have rendered their service to society, is the group composed of those who have reared their children and sent them out into the world. The home that sheltered them when all the family were together may now be too large, too much of a burden. Many will continue to maintain it because of sentiment, but others will desire and should have a more convenient shelter. Their problem is not met by old folks' homes, however those may be disguised by luxury. Perhaps the nearest approach to a solution is the occasional multi-family dwelling where through some happy circumstance of management, tenant leadership, or a common dining room, the inhabitants mingle for a time in the evening, and the older people have opportunity to maintain some daily contact with younger people.

Then come the unattached individuals who form the tragedy of civilization, often not recognized by its victims until they reach middle age. Their variety is so great, class merges into class so imperceptibly that it is difficult to classify them definitely. They range all the way from the well-to-do bachelor who lives at his club and thus has the casual social intercourse with his fellows that fills so many of the odd moments of contented living, the lack of which reduces living in period of conscious effort interspersed with periods of loneliness; from the two spinsters who have joined forces to fight off loneliness and who live together in a little apartment, through those forlorn ones who inhabit boarding houses—a form

of housing now apparently on the decrease—hotels and rooming houses—a form of housing now apparently on the increase. This great army is recruited from the youth of the land who venture forth in search of fortune. Its veterans are those who fail to make a family harbor. The problem of the unattached, whether it be the well-known "homeless man" who patronizes municipal lodging houses, or the wage-earning woman, whether it be the raw recruit or the veteran left-over, is one that has not yet begun to be solved in spite of the voluminous literature dealing with fragments of it—perhaps because this literature does deal with fragments only instead of with the problem as a whole.

CLASSIFICATION OF HOUSES

For the population that is to be housed in a carefully-planned region there is choice among the following types of dwellings:

One-family houses [one family, occupying the whole house from cellar to roof]: Detached; semi-detached; group; or row.

Two-family houses [one family above the other] subdivided as previously described.

Multi-family houses [ranging from the building in which every apartment is equipped for housekeeping, through that where a common dining room supplements or supersedes the housewife's efforts, to the hotel where cooking in an apartment is strictly forbidden]: Detached; group; or row.

Somewhat apart from any of those mentioned are the boarding house and the lodging or rooming house. These are not a distinct type of housing, but are merely the result of opportunist attempts to utilize the waste resultant from lack of city planning and a housing policy in the past. When the day comes that there are no more blighted districts, no more cast-off dwellings, the boarding house and rooming house, as they are known to-day, will disappear, their places being taken by houses designed for the purpose. Instead of a shame-faced dilapidation, recalling better days, they will evidence the self-respect of those who accomplish what they intend to do.

With this classification of houses; with a clear understanding of the function of each class; with a regional plan, zoning regulation, and an intelligent distribution of centers of employment so that there will be ready access from home to shop; with a stabilization of the character of neighborhoods and, consequently, of house values, and, not least important, a clearer recognition of the value of space, both inside and outside the

house, but part of the same domain so that alterations and improvements may be made, it will be comparatively easy to develop a housing policy designed to serve adequately the needs of the population.

Each individual has conflicting desires among which he must choose. Each might prefer to live in the White House, not because of an ambition to be President, but because the house has the desirable characteristics of a family dwelling; it is spacious and set in a very pleasant yard large enough for children's play and even contains a tennis court, and, in addition, it is most accessible from its tenant's office which is easily reached by his chief business associates, and, to add excellence to excellence, to satisfy the other head of the family, it is cheek by jowl with the principal shopping district, within a block or so of two theatres, and within easy reach of the others. In short, it would seem to be ideal. Certainly, as Lincoln is reported to have observed, most of its tenants desire to renew their leases.

Although this combination is provided for Presidents, most families have to make choices. If convenience of access of department stores is more important than home or children, an apartment near the center of one of the larger urban units or along one of the arterial highways is selected. If we no longer have children or expectation of them, a similar choice may be made, although some recent subdivisions give reason to hope that it will be possible to find a small house of five or six rooms, attractively designed and located in a pleasant neighborhood, thus doing away with the present hard choice between an eight to ten-room house and a five-room apartment. If there are growing children a one-family dwelling will be chosen, a little less accessible from the centers of work and amusement, but compensating for this by giving neighbors who have the same chief interest and who have a greater tendency to stay put long enough for the development of family acquaintance, parents with neighbors' children, as well as the horizontal acquaintance of apartment-house populations which tends to follow the line of age groups.

The greater stabilization of the character of neighborhoods will encourage investment in rental housing by increasing the life expectancy of the individual house. It will lead to the wider use in one-family house districts of services now characteristic of multi-family houses. Stabilization which reduces the speculative factor in real estate, which turns attention to permanent investment values, should result in creating again the estate or company that owns or manages a considerable number of one-family houses, for these depreciate, become obsolescent less rapidly, cost

less to maintain and, provided they have open space about them, are more readily kept in step with "modern improvement," than are multi-family dwellings. Some of the finest dwellings are one-family houses built 50 or 100 years ago. Some of the old one-family house districts after a period of decadence have come back strongly. Few multi-family dwellings have maintained the standing of their youth until reaching their majority, and none, so far as the writer knows, has ever come back after it once lost prestige.

Probably this has been due chiefly to misplacing. They have themselves spoiled many neighborhoods and, in time, have suffered from the deterioration they caused; or they have been injured by the invasion of business. In a planned and zoned region these causes should be removed. There obviously will be space enough so that the temptation to land-overcrowding will be reduced. There will be system and order so that each type of dwelling will have that place best fitted to its purpose. Zoning does not imply a series of girdles about an urban center, but it does imply an arrangement in relation to traffic and traffic facilities. The regional plan will guide the development of traffic facilities, types of dwellings will be placed in accordance with their need of these facilities, and zoning regulations will prevent the placing of an inferior type in a district where it does not belong.

County planning.—County planning is generally considered as in the nature of regional planning, with the county as the planning unit and county lines as the boundary lines of the region. Official county-planning commissions are operating in Los Angeles and Santa Barbara Counties, Calif.; Glynn County, Ga.; Detroit and Wayne County, Mich.; Mercer County, N.J.; Putnam, Onondaga, and Monroe Counties, N.Y.; Hamilton and Lucas Counties, Ohio; Allegheny County, Pa., and Milwaukee County, Wis. In many instances the areas in which regional planning is most desirable and to which it is best applicable are not those limited by the existing lines of any single political unit, as town or county, but overlap such lines, making the appropriate planning body a regional-planning commission whose jurisdiction may include parts of one or more counties or parts of one or more states [LESTER G. CHASE, *Survey of City Planning and Related Laws in 1929* (mimeographed circular; Division of Building and Housing, U.S. Dept. of Commerce, 1930)].

SLUMS AND THE CITY PLAN[1]

BY EDITH ELMER WOOD, PH.D.

The city-planning and housing movements in most European countries are so closely intertwined that this relationship is taken for granted. In the United States they have had separate origins and run generally parallel courses without much contact except in the field of zoning. This is regrettable from every point of view. Slums unfortunately exist, and we cannot get rid of them by ignoring them.

An American city plan concerns itself largely with street and traffic problems. It aims to provide efficient circulation. It also deals with parks and playgrounds and with the location of public buildings. When it gets to zoning, it has to think about homes, their neighborhood, height, bulk, light and air, but its only concern is with the homes of the future. Where a new town is being laid out, this is all that is necessary. In an old community with an unregulated past, it is tragically inadequate. A cancer patient needs a surgical operation, however true it may be that prevention is better than cure.

What is a slum? The word is at once unscientific and offensive. It should undoubtedly go into the discard. But it is so short, descriptive and easy-to-say that we shall probably go on using it. Subnormal housing sounds colorless, and the British official term "unhealthy areas" is even more vague. A slum, then, is a dwelling, a group of dwellings, or a whole district, which is injurious to health, morals or family life. So defined, about a third of our people live under slum conditions, more or less acute. To present the data to prove this would lead us too far afield, but the proof is available. The definition covers bad conditions in great cities, small towns and rural areas. Most Negro families, a majority of the foreign-born, and millions of native white Americans live in homes which hurt them physically and psychically.

FOUR CONDITIONS WHICH BREED SLUMS

Slums may be due to any one of four conditions, which it is necessary to distinguish sharply if we are to have clear thinking on the subject. In individual cases, two or three, or even all four, may be present together.

1. We have slums produced by faulty layout—too narrow streets or too large blocks inviting courts, alleys and rear tenements. The North End of Boston offers a classic example of both types, while the inhabited

[1] Adapted from "Slums and the City Plan," *American City*, August, 1929.

courts and alleys of Washington and old Philadelphia illustrate the effect of over-generous blocks. Better city planning could have prevented all this, but only clearance and replotting can cure.

2. Bad structural plans of the dwellings themselves may be the trouble. Where they cover too much of the lot and have dark interior rooms or dimly lighted rooms opening on small interior courts, there is ordinarily no cure but demolition. The most conspicuous example is afforded by the old "railroad" tenements of lower New York (built before 1879) which run from street to rear yard, four to eight rooms deep, with windows to the outer air in the front and rear rooms only. Proper housing or building codes, or zoning ordinances, prevent such conditions in future buildings, but cannot cure them where they already exist.[1]

3. A great deal of bad housing is caused by disrepair. Here the landlord is primarily responsible, but the tenant should in some cases share the blame.

4. The last group of housing evils are due to the tenant. They include (*a*) overcrowding and (*b*) uncleanliness, which are frequently referred to by those who should know better as if they were the only factors in bad housing. Obviously, tenants have no responsibility whatever for headings 1 and 2, and in many cases they have none for 3.

WHERE THE RESPONSIBILITY LIES

City planners cannot be expected to concern themselves with such matters as are summarized under 3 and 4. It is for health and housing authorities to enforce repairs and cleanliness and to prevent overcrowding. Visiting housekeepers, the schools and the public press must be relied on to build up gradually a better standard of hygiene within the home.

With the residuum, however (slum conditions produced by faulty layout or by faulty structural plans in respect to light and air), the city planner ought to concern himself very deeply, for he alone holds the key to the solution. It is strange that his imagination has been so little stirred by the opportunities offered. A slum section is a liability to a community from every point of view—physical, mental, moral, industrial, economic. It does not tend to rehabilitate itself through the ordinary workings of supply and demand. The people who live in slum sections cannot afford to pay a profitable rent on new houses. Therefore none are built for them. Nor will better-to-do people move into such neighborhoods. The New

[1] Structural inadequacies consisting of lack of proper toilet or bathing facilities may ordinarily be remedied without demolition where water mains and sewers exist.

York Commission of Housing and Regional Planning calculated that, on the basis of the 1909–1925 rate of demolition, it would take the "old law" (pre-1901) tenements of New York 138 years to disappear. When we are told that the average life of a building in the United States is something like 25 years, such reference is not to slum sections, where stagnation is the rule, but to the regions of most rapid development, such as those occupied by costly skyscrapers.

The writer's thesis is that the only cure for slums of classes 1 and 2 lies in muncipal clearance schemes, and that these should form, not isolated activities of the health and housing departments, as is necessarily the case in Great Britain under existing town-planning limitations, but an integral part of every city plan which deals with an already existing community.

SLUM CLEARANCE—WHAT IS IT? DOES IT PAY?

It will be useful at this time to consider: What is slum clearance? Where is it? Does it pay?

Slum clearance is the acquisition by city or other authorities of slum areas declared injurious to public health or morals, followed by demolition and a new layout of streets and open spaces. Usually, the same authority builds new accommodations, on the site or elsewhere, for as many persons as have been displaced by the clearance. This is mandatory in Great Britain.

Slum clearance, undertaken as a health measure, is found in many European countries, but especially in Holland and the United Kingdom. Liverpool and London have the longest and largest experience, but Glasgow, Manchester, Birmingham, Amsterdam, Rotterdam and The Hague all have much to teach us.

Whether it pays or not, in the larger sense, depends on the extent to which the displaced tenants are gotten into the new houses. Where they are scattered and lost track of, the advantage is doubtful. One locality has been improved at the expense of others. The technique of retaining old tenants in new houses has improved much since 1900. Under present-day methods, only a small part of a clearance scheme is torn down at once. The tenants are moved, without expense to them, into temporary quarters owned by the city, which are popularly known in England as "decanting stations," whence they are moved back when the new houses are ready. In Holland, especially at Amsterdam and The Hague, a definite educational use is made of the interval.

BRITISH EXPERIENCE

Where the same population returns to the new houses, carefuly kept vital and social statistics, before and after, show the extent, in a few years' time, to which health and behavior have improved under better environment. Liverpool statistics have shown this in the past with special clarity. Death rates and sickness rates are cut in two and anti-social behavior, as indicated by arrests, even more strikingly reduced. As a recent Glasgow report expresses it, 90 per cent of the families react to their new surroundings in a satisfactory manner.

Viewing clearance schemes as health measures, they undoubtedly save the taxpayers more in hospitals, asylums, reformatories and relief than they cost. And the amount of that cost is often exaggerated.

Take London. It had carried out before the war 35 slum clearance schemes, involving 97½ acres, displacing and re-housing 46,000 persons, at a total net cost to the taxpayers of £2,393,000. For the 23 post-war schemes, involving a similar global area (98 acres), but displacing only about 28,500 people, the cost of acquisition, clearance and road work is estimated at £1,259,250. The re-housing operations will involve some subsidy, which was not the case before the war, but the National Government will share the burden with the London County Council. Altogether, for a measure which halves the sickness and death rates of the population immediately affected, and which reduces those of surrounding areas by lessening the number of infection centers, it cannot be considered excessively costly.

DECENTRALIZATION AND RE-HOUSING

Ideally, a large slum clearance scheme could be linked with a decentralization scheme to their great mutual advantage. In practice, it has never, so far, been done. If the industries employing part of the residents in a slum section were moved to a satellite garden town offering good housing to the workers, many more would follow if they were being simultaneously dispossessed at home than if it was all pull and no push. Those remaining on the site could be better housed than would otherwise be possible, and surplus land could be sold for business or other purposes, reducing, if not wiping out, the cost of the improvement to the taxpayers. In addition to which, the transplanted families would be far better off than if they had remained.

No instance of slum clearance with re-housing has yet occurred in the United States. Minor slum clearance may be said to have taken place

where a small park or playground has been established as much for the sake of getting rid of bad houses and bad layout as of obtaining the breathing space. Cases in point were Mulberry Bend Park in New York, Willow Tree Alley in Washington, Morton Street in Boston and Hell's Half Acre in Philadelphia.

NEW YORK'S PROJECTS

In recent years New York has been fairly seething with projects for getting rid of its slums, but few of them have had much connection with city plans. The important provisions of the State Housing Act of 1926 deal with problems of finance—limited-dividend housing companies, limited rentals and tax exemption—and with compulsory acquisition of slum property.[1] The Heckscher-Walker scheme involved the use of excess condemnation for the city to acquire slum areas in connection with street-widening projects.

In the spring of 1928 the United Neighborhood Houses of New York adopted a report, prepared by their Advisory Housing Committee, which proclaimed, among other things, that:

> A permanent City Plan Commission should be established, with a mandate to consider housing as one of its major problems. . . . . Slum clearance should be included in the city plan and carried out gradually like any other large improvement project. It is vastly more important than the elimination of grade crossings, for instance, though the lives sacrificed by bad housing are not quite so easy to count.

About the same time, June, 1928, appeared the report of the Subcommittee on Housing (Lawrence Veiller, Chairman), of the vast Committee on Plan and Survey appointed by Mayor Walker, which had this to say:

> The one phase of housing that has had the least attention in this city and the one that is perhaps most urgently needed is that of slum clearance. Before doing anything, the location and extent of the areas it is desired to clear should be determined. These will be found not limited to the East Side nor even to the borough of Manhattan. . . . . Whatever is done should be closely related to a comprehensive city plan. . . . . In some cases the cleared areas can be best devoted to permanent open spaces—to small parks and playgrounds; in others, public buildings. In others, such cleared spaces may be best utilized for increased traffic facilities, for new streets and street widening. . . . . One thing is certain. If slum clearance is to be carried out, it should be in orderly and intelligent

[1] See "Better Housing for New York's Wage-Earners," by George Gove, in *American City*, May, 1929, p. 164.

fashion. It cannot be done as an incident to street improvement, as now contemplated . . . . though excess-condemnation powers can be utilized. Areas should be cleared only after a "finding" by the duly constituted authorities that either (*a*) the area is an insanitary area, or (*b*) that the public interests require its demolition. A special "authority" should be constituted for the purpose, if slum clearance is to be done on a large scale. . . . . Maps should be prepared showing the property to be taken, and property owners affected, as well as other citizens, should be given their day in court with opportunity to object and to state their views. . . . . The special authority should also determine whether to sell off, or lease, part of the land acquired, to be used in new housing and on what terms. It would also determine to what extent the cost of the scheme should be borne, in part, by assessment for benefit on property benefited and the extent of the area of benefit. Specific powers should be obtained from the Legislature to enable the city to undertake slum clearance schemes.

All of which are words of wisdom, which will, we hope, be heeded. But let us take heed also of the half-century's experience in slum clearance available for our study across the water. And let us recognize from the start that slum clearance will fail of attaining its principal objects—better health and better homes—if it does not provide new accommodations for those whom it displaces, and at rentals they are able to pay. This cannot be done on the basis of private enterprise for commercial profit, but . . . . it ought to be possible to do it without subsidy. If not, our people might still be wise to tax themselves for good housing instead of for hospitals and jails.

WHAT MAKES THE CITY BEAUTIFUL?[1]

BY GEORGE B. FORD[2]

We have found that the mere machine, however efficient it may be, does not satisfy the soul. It is proving only too true that "Man cannot live by bread alone." In a flood of recent "Main Street" books we have been shown all too graphically what drab, barren, uneventful lives we live. Yes, most of our towns are colorless and anything but inspiring and so perhaps a wistful longing comes over us to recapture some of the beauty of life that seemed to promise in the fascinating years of childhood.

Even the hard-headed practical business man may make a cult of de-

[1] Adapted from "What Makes 'The City Beautiful'?" *Planning Problems of Town, City and Region; Papers and Discussions* (National Conference on City Planning, 1929), pp. 170–78.

[2] Before Mr. Ford's death he served as director of the Regional Plan Association of New York City and vice-president of the Technical Advisory Corporation.

crying whatever savors of beauty as something effeminate, the work of long-haired dreamers. Yet that same man often insists on good-looking furniture, a beautiful etching or painting in his office, or he spends much time picking out just the right cravat or a new spring suit. He gets away as soon as he can to go out to a beautiful golf course, cunningly landscaped, and for his vacation he goes to the mountains, or the shore, or the woods, where nature is at her most perfect.

No, the demand for beauty is innate, and while a certain Puritanical hold-over and a childish expression of red-bloodedness may induce us to repress outwardly our need for beauty, nevertheless it is there waiting for release. All that was needed was that good looks should become "the thing." The turning point has come. To-day beauty is no longer looked at askance. To-day we can insist on attractiveness in our surroundings without being thought queer. No longer do we have to make our towns merely safe, healthy and convenient. Openly we can make them attractive as well. However, that which appeals to the eye, that which is really attractive, does not just happen of its own accord. It is rarely accidental. Beauty is not a cosmetic, just applied to a building or town. It is not superimposed by planting geraniums or putting filigreed ornaments on lamp-posts. No, beauty, is more than skin deep. It is fundamental and basic in the design of any object.

Mr. Frederick Law Olmsted once said, "Beauty is a closer approach to practical perfection in the adaptation of means to ends than is required to meet the merely economic standard." Good looks is doing the efficient thing more appropriately. It means making the bridge or the museum or the factory look the part, express its function, as well as serve its purpose. In any case design implies good taste. Without taste there can be no real beauty, but the great work of art, the building or the town that will live down through the ages, must have in its design that same inspired vision on the part of the creator that characterizes all the great works of art that have come down to us.

The interesting part of it is that this extra effort, this good taste, this appropriateness, this inspiration need add nothing to the cost. As a matter of fact, experience proves it may even save cost because good taste usually means simplification, and simplification means the elimination of non-essentials. . . . .

Somehow our towns, so well planned for safety, health and efficiency, have failed to inspire our enthusiasm. True, we were boosters for our town because it was the thing to do; it was expected of us, but any other

town would have done just as well if our family and our work happened to be there. No, the town lacks charm. It lacks appeal. To be sure, nature gave the town a good start, but from then on the few that loved nature had a constant losing fight to keep even that inheritance intact. The town may have buildings of great historical value or of unique Colonial architecture, but one after another they disappear—gone forever, for once gone they can never be replaced.

Our fathers planted street trees because they loved trees. They have become one of the great assets of the town, and yet without a protest the lineman ruthlessly slashes great gashes through them, with only the most feeble protest on our part. We have betrayed our trust. The misguided business man insists on felling the beautiful great elms in front of his store. A curious idea seems to have insinuated itself over the country that trees harm business, and yet the best business streets either in Washington or Paris are lined with trees. In any case, if trees must be removed on account of imperative roadway widening, by all means new ones should be planted to replace them. Fortunately to-day planning boards all over the country are insisting in their platting regulations that all subdividers shall plant trees along their streets. Perhaps there is no one thing—certainly nothing that costs so little—that can make "The City Beautiful" as street trees.

And then come the street poles and wires. Is there anything conceived by man that can make an otherwise decent street look more tawdry, more one-horse, more down-at-the-heels than a welter of poles and wires? If familiarity only would breed contempt, but instead it merely breeds indifference and the crime persists. Without fail the moment the wires are buried in conduits, or removed to rear alleys or rights-of-way everyone exclaims how much more attractive the street looks, and then they wonder why they had never done it before. Perhaps next to street trees the removal of poles and wires can do more to make "The City Beautiful" than any other one thing.

Then come the billboards, sky signs, signs that overhang the sidewalks and even the wayside stands, but here, most fortunately, we have a strong organized movement, thanks to Mrs. Lawton, Mrs. Rockefeller and others. [In 1929] over 800 cities and towns, containing over one-third of the population of the United States and nearly two-thirds of the urban population, had eliminated all billboards and wayside stands from all residence districts, and they are controlling the size and location of advertising signs in business districts. Massachusetts has gone further and has

taken the lead in controlling billboards along the highways, while the leading provisioners of the country are setting a splendid example in suppressing the billboards and greatly improving the wayside stands. All of this is helping markedly in making not only the city but the country beautiful and will repay all effort given to it a hundred-fold.

The street-lighting fixtures, hydrants, letter boxes and fire-alarm boxes are all important. Not many years ago anything would do. To-day the fixture-supply houses have vastly improved their designs. The result is much more attractive street perspectives. If we could only eliminate the electric light that just protrudes on an iron pipe from the ugly wooden pole. Grass borders, flowers, shrubs, central parklike strips, parkways, attractive kiosks or news-stands, seats, fountains, monuments, statues—one and all make the "street picture." We may not be conscious of them, but subconsciously they give us a sense of well being and satisfaction and a certain unconscious pride in the street that makes the effort devoted to them well worth while. Such an asset do they prove in selling property that the wide-awake subdivider to-day features such things as these in his subdivision layout. He finds that they pay.

There is a lot that can be done with the "street picture" either by ordinance or by persuasion. The requirement of most zoning ordinances that the buildings, especially in residence districts, should set back from the street line is a case in point, although subdivision design shows that a lot of the monotony of our streets with their regular setbacks can be avoided by proper grouping of buildings and the grouping of setbacks so as to form a good composition of a block or street as a whole.

The new skyline of New York, with its stepback terraces, towers and gables, is not an accident. Far from it! When we were zoning New York and trying to see how we could get the greatest amount of light and air down into the street we tried at the same time to picture how terraced-back buildings were going to look. To keep them from being monotonous and standardized we made little models in harness soap of virtually all the new types of skyscrapers and many other types besides, and we drafted our stepback regulations so that they would permit all the variety and spontaneity of treatment that we are revelling in to-day.

In the fire limits of our building codes we are again assuring at least a certain substantialness and permanency in the construction of our more congested districts. In our control of plats and subdivisions, thanks to the board of vision of the National Association of Real Estate Boards, we are not only securing a much more orderly development of our suburbs

but a marked improvement in the "street picture" of the new suburban highways.

However, all of this is in only a negative control of our street architecture. This municipal control can at best only keep the buildings from being too bad. It does not make the frame of the "street picture" positively good. As far as public buildings and public structures are concerned, there is no doubt but that we have made remarkable progress of late. We have only to look through the architectural magazines to be overcome by the astonishing number of most attractive public buildings that to-day are scattered from one end of the country to the other. This is something of which we may well be proud. In part this has been accomplished by the art commissions and art juries which control the designs of all public structures, but primarily this advance is due to a marked improvement in public taste and a noteworthy demand for public buildings in which the citizens may take a legitimate pride.

On the other hand it is the great preponderating mass of dull private buildings that recently led a well-known architect to remark that even Washington was only 25 per cent good architecturally. That is, only a quarter of the buildings would stand the test of time, whereas he considered that in most of our other large cities we would be lucky if 10 per cent survived public taste for more than a generation. For a country that is settling down to permanency these are dangerously low averages.

Or, from another point of view, our most lasting impression of a new city or town is our first impression. If that first impression, whether we approach by water, railroad, road or air, is good; if the "gateway" to the town is welcoming and interesting, we carry away a sense of delight that we will never forget. In our airports we can at least profit by the horrible example that the railroad affords, where we often have to go into the city through miles of unkempt factories or squalid tenements—the city seemingly to turn its back on the visitor—only to arrive in the vast, murky, confusing cavern which serves as a terminal. At least the airport can be bright and welcoming and the approach can be through open fields and attractive suburbs.

To-morrow our city plans, which yesterday were dead and meaningless things to most of us—just so many lines on paper—are now coming to life, for now we can actually visualize the city map as we approach from the air. It becomes a thing alive with color, form, shadow and movement. So important is this becoming that we are actually beginning already, fortunately, to prevent a repetition of our billboard pest by prohibiting

roof advertising, but we must make this prohibition as nearly uniform as we can, and as soon as we can, for to-morrow it will be too late.

Yes, the air pattern of the town is now becoming the test of whether the community is well planned or not. If it "mosaics" well, the planning has been well done.

From the ground, too, we are beginning to study the mass or composition of the town. We study its silhouette to see that the buildings compose well. When you go between Philadelphia and New York on the Pennsylvania and look at Princeton three miles away, with its picturesque massing of roofs, towers and trees, you cannot help feeling the thrill that comes as you stand before a great work of art. In recent studies of Chicago, Detroit, Toronto and Ottawa from the water a similar silhouette was being sought.

"The City Beautiful" is largely a matter of harmony and appropriateness; of fitness of form to function, all of which leads to individuality or personality. A town has personality according as it appears to be appropriate to its function and site. As a matter of fact, the "typical American city" is utterly lacking in personality. It is typical only in so far as it is rubber-stamped—just another standardized model struck from the same old die. By contrast, old Charleston, S.C., Vieux Carre in New Orleans, St. Augustine, Fla., or Beacon Hill in Boston, do have a most refreshing personality because they express with all spontaneity the feeling and purpose of their time and site. Every community has some individuality of its own, if we can only find it to express it. Santa Barbara, rising from its ruins, is doing this very thing and many recent subdivisions from Palos Verdes to Radburn are making a most laudable effort to express appropriateness, harmony and personality. Scale, too, is important, although it is the easiest thing in the world to miss by default as witness the plans to erect 15 and 20 story apartment houses directly on the top of the glorious Palisades opposite New York where the Palisades will be reduced to mere retaining walls for the incongruous cliff dwellings which will soon crush them.

In the last analysis the attractive city is a matter of design—design in form, in color, in texture, full of variety and contrast and yet harmonious; where buildings, public and private, group into interesting masses and silhouettes; where color and texture is placed so as actually to form good compositions such as you would expect in a good painting or in a good oriental rug; where the views which you get here, there and everywhere throughout the city or town are not a hodgepodge of form or a kaleido-

scope of color but an ordered arrangement with all the beauty that any work of art should have.

It is not inconceivable that the congestion piled on congestion that the centers of some of our cities have now attained is actually precluding the possibility of good civic design. Perhaps we can only attain permanent civic beauty by ruthless decentralization of our cities, saying that if they will grow they must grow centrifugally by the creation of new isolated satellite communities far enough from the center so that they can always avoid the untoward congestion of the metropolitan hub.

However that may be, we will only attain "The City Beautiful" as well as the city practical by establishing and maintaining a policy so logical and so appropriate that continuity is inevitable. It is being found in America, as it already has been found in Europe, that the architect is preeminently a coördinator by training. He is particularly suited with his highly trained imagination and taste to take the ideas of the engineer, the lawyer, the economist and psychologist and transmute them into the living inspired plan. He should be given every encouragement to do this most vital thing: By the establishment of art juries or commissions to legally control the design of all public structures, by the creation of advisory architectural councils or commissions as they have in Washington and Santa Barbara, by the creation of street associations, such as the famous Fifth Avenue Association in New York, and by means of subdivision art juries, which through persuasion and gradual education, through the schools and numerous organizations, can gradually make attractive structures, interesting "street pictures," the "things to do." What we have already done in our automobiles and airplanes we can surely expect to do in the civic design of our cities, towns and countrysides.

California has pointed the way in its famous Planning Act of 1927 which is designed "to best promote the amenities of life, health, safety, etc." and "the improvement and control of architecture and general embellishment of the area under its jurisdiction." This means a first attempt at a public control of private architecture—a thing which has been accepted for generations in Europe as essential. Perhaps our courts are not ready yet to sustain such a control, but the time is coming in the near future, with popular taste growing as rapidly as it is, when the public will force the courts to extend their protection of property against those things which are offensive to the nose to include those things also which are offensive to the eye.

We are at the beginning of a new era in the planning of our American

towns; the pioneer period gave way to a great period of material expansion where efficiency and service were the watchwords. To-day with our rapidly increasing wealth and leisure we are insisting more and more on the amenities of life. History says that that means beauty. The new period we are now entering is one where utility and beauty will share alike. Neither will satisfy without the other. Together they will make our American towns a delight and inspiration to all.

WHAT IS ZONING?[1]

Zoning is the application of common sense and fairness to the public regulations governing the use of private real estate. It is a painstaking, honest effort to provide each district or neighborhood, as nearly as practicable, with *just such protection* and *just such liberty* as are sensible in *that particular district.* It avoids the error of trying to apply exactly the same building regulations to every part of a city or town regardless of whether it is a suburban residence section, or a factory district, or a business and financial center. It fosters civic spirit by creating confidence in the justice and stability of the protection afforded.

Zoning gives everyone who lives or does business in a community a chance for the reasonable enjoyment of his rights. At the same time it protects him from unreasonable injury by neighbors who would seek private gain at his expense.

Zoning regulations differ in different districts according to the determined uses of the land for residence, business, or manufacturing, and according to the advisable heights and ground areas.

But these differing regulations are *the same for all districts of the same type.* They treat all men alike.

WHY DO WE NEED ZONING?

Some one has asked, "Does your city keep its gas range in the parlor and its piano in the kitchen?" That is what many an American city permits its household to do for it.

Yet many American cities do the same sort of thing when they allow stores to crowd in at random among private dwellings, and factories and public garages to come elbowing in among neat retail stores or well-kept apartment houses. Cities do no better when they allow office buildings so

[1] Adapted from *A Zoning Primer.* Division of Building and Housing, U.S. Dept. of Commerce, 1926.

tall and bulky and so closely crowded that the lower floors not only become too dark and unsatisfactory for human use but for that very reason fail to earn a fair cash return to the individual investors.

It is this stupid, wasteful jumble which zoning will prevent and gradually correct. We must remember, however, that while zoning is a very important part of city planning, it should go hand in hand with planning streets and providing for parks and playgrounds and other essential features of a well-equipped city. Alone it is no universal panacea for all municipal ills, but as part of a larger program it pays the city and the citizens a quicker return than any other form of civic improvement.

ZONING PROTECTS PROPERTY AND HEALTH

Suppose you have just bought some land in a neighborhood of homes and built a cozy little house. There are two vacant lots south of you. If your town is zoned, no one can put up a large apartment house on those lots, overshadowing your home, stealing your sunshine and spoiling the investment of 20 years' saving. Nor is anyone at liberty to erect a noisy, malodorous public garage to keep you awake nights or to drive you to sell out for half of what you put into your home.

If a town is zoned, property values become more stable, mortgage companies are more ready to lend money, and more houses can be built.

A zoning law, if enacted in time, prevents an apartment house from becoming a giant airless hive, housing human beings like crowded bees. It provides that buildings may not be so high and so close that men and women must work in rooms never freshened by sunshine or lighted from the open sky.

ZONING REDUCES THE COST OF LIVING

By zoning, millions of waste from the scrapping of buildings in "blighted districts" may be eliminated.

A "blighted district" is a district, originally developed for residence or industry, in the future of which people have lost confidence.

The causes of such "blight" are manifold. The most familiar case is that of a residential district into which there have begun to creep various uses threatening rapid destruction of its value for residences—such new uses as sporadic stores, or factories, or junk yards. It is not that a few such inappropriate uses really spoil the district, but that people having lost confidence, start a panic like a "run on the bank." Hundreds of them hurry up to "unload" their properties at a sacrifice for any kind of use, no

matter how objectionable to their neighbors—and the "blight" is on! Dwellings worth in the aggregate millions of dollars for the purposes for which they were built, and physically fit to serve those purposes for many years to come, with a moderate investment in alterations and improvements, are thus annually abandoned to purposes for which they are not fit, or are left to stand practically idle. Expensive public services of water, gas, electricity, sewers, and transportation are maintained at great waste in order to get through the "blighted" district to the more distant and newly fashionable location.

The total economic loss is enormous, and this loss and the risk of it are paid by the people, in the price of house rents or otherwise, as inevitably as they pay the price of the enormous fire losses, either directly or through insurance.

Proper zoning cuts these losses at their source, just as proper building regulations and fire protection cut fire losses at their source.

Again, miles of streets and sewers and other utilities, such as are ordinarily built when land is newly subdivided for dwellings, need never be constructed if we know that these areas will be devoted mainly to large factories. Industry will be more efficient, as well as homes more wholesome, if kept generally separate. Separation need not mean great distances for workers to travel. Concentration of uses and a fair apportioning of districts should reduce the amount of all transportation and secure economies not only directly for the worker but indirectly in the costs of production and marketing of goods.

If zoning can reduce the cost of living, why not have it?

ZONING IS LEGAL

When a zoning law is properly drawn there is no doubt that the courts will support it. Enough favorable decisions have been handed down to show that the courts regard regulation of the uses of land and structures thereon, in accordance with the *kind* of district in which they are situated, as a reasonable exercise of the police power "for the public health, safety, and general welfare."

HOW TO GET STARTED

Enabling act.—Before any community undertakes zoning it must make sure that it has the power to pass a zoning ordinance. A general state enabling act passed by the state legislature is always desirable, and while the power to zone may, in some states, be derived from constitutional, as

distinguished from statutory, home rule, still it is seldom that the home-rule powers will cover all the necessary provisions for successful zoning. The United States Department of Commerce has issued A Standard State Zoning Enabling Act which contains all provisions needed. . . .

Zoning commission.—There must be some local official body to initiate the work of zoning. If there is a planning board or commission, that is the logical body to take up the problem. If there is no such body, one should be created, because zoning, to be done with wise foresight, must take account not only of existing conditions and obvious tendencies of growth but of probable changes and improvements of many sorts. It is part of the general planning problem. It relates to the transportation system, including streets, street railways and other local passenger transportation, railroad freight and passenger service, and water-borne commerce, if any. It relates also to public works and utilities, to parks, schools, and many special public and private undertakings.

A ZONING PROGRAM

Surveys.—A zoning ordinance needs to be based on a comprehensive and detailed study of the precise *local conditions*, both present and prospective. What fits one city or town may be a bad misfit for another. There is no short cut to good zoning in any community through blindly accepting what has been done for another community. The only safe path is a thorough, open-minded examination of the facts in each community as to existing uses, existing densities, and heights of buildings, the customs of the people, and the trend of affairs. In every city there are citizens and organizations having in their possession valuable knowledge of local conditions. These have a large contribution to make to those responsible for zoning, although those who have lived their whole lives in a community do not necessarily realize all that is going on about them.

The zoning of a city requires expert professional knowledge just as the presentation of a case in court requires legal training. But just as the lawyer depends upon the layman to secure his facts, so must the professional zoning expert call upon the citizens for much of the accurate information upon which any good zoning regulations must be based.

Technical advice.—The practice of zoning is relatively new in America. We are feeling our way and must learn by experience. Those who have had experience tend to become expert, with broader knowledge of practices that are proving effective. These men are becoming gradually more skilled in the methods of getting at the essential facts of any local situation

and in the interpretation of those facts. If they possess insight and sane judgment, their advice becomes increasingly valuable.

Scope of a zoning ordinance.—A zoning ordinance consists of one or more maps dividing the city into different kinds of districts; and a statement of methods of regulation to be employed in each district in regard to the use to which property may be put, the height and size of buildings, and the amount of space to be left vacant, with adequate provisions for enforcement.

Importance of correct procedure.—Certain points in procedure have proved themselves workable as practical steps for securing carefully drawn zoning measures, and ordinances so adopted are less liable to attack in the courts. These points are set forth in the standard enabling act of the Department of Commerce, with the aim of encouraging proper satisfactory measures well within the police power. The most important of them are:

1. Proper definition of the purposes for which zoning may be undertaken.
2. Uniformity of regulations for each class or kind of buildings throughout each district.
3. The appointment and functioning of a zoning commission.
4. The careful preparation of regulations with reference to the character of the district and its peculiar suitability for particular uses.
5. The holding of public hearings.
6. The method of changing the ordinance.
7. Rules for establishing a board of adjustment.
8. Provision for adequate remedies against violations of the ordinance.

Getting public support.—In the process of drafting a tentative ordinance it is important, by means of full public discussion, to be sure that the ordinance is an "application of common sense and fairness" and will "provide each district, as nearly as practicable, with *just such protection* and *just such liberty* as are sensible in that particular district." It is essential likewise to be sure that public opinion, as a whole, will support it.

Zoning in operation.—A zoning ordinance is of value only as it is properly enforced. Because of the difficulty in making with precision the forecasts on which it is based, its operation should be closely followed by those who most intimately understand the reasons for its provisions. Thus, improvements and adjustments may from time to time be made intelligently. It is to furnish in exceptional cases means for remedying possible injustice that, in the standard act and in some other state laws, provision is made for a board of adjustment or appeals.

It is obvious from the nature of the case that, even if a zoning ordinance

were drawn with superhuman perfection, time and the natural growth of the community might show the need of modifications. The purpose of a zoning ordinance is not to stifle growth, but only to insure that instead of taking place sporadically and wastefully it shall go on in an orderly way, in response to generally recognized needs and with due notice to all concerned.

WHERE TO GET INFORMATION

The Division of Building and Housing of the Department of Commerce at Washington, D.C., maintains a current list of zoned municipalities and of zoning enabling acts passed by state legislatures. The division is always glad to answer inquiries in its field of work. . . . .

[NOTE.—*Zoning ordinances:* Zoning ordinances were in operation in 981 cities, towns, and villages throughout the United States in 1930. This represented more than 46,000,000 people. Of the 48 states, 47 and the District of Columbia have granted zoning authority to municipalities. In the state of Washington, cities of the first class are permitted zoning regulations through the home-rule provisions of the constitution. Information on zoning progress may be obtained from the Division of Building and Housing, U.S. Dept. of Commerce.]

ZONING AND HEALTH[1]

By PROFESSOR GEORGE C. WHIPPLE[2]

Zoning is an essential part of city planning. Generally speaking, about three-fourths of the land area of a city is privately owned and subdivided into blocks and lots; the other fourth, devoted to streets, parks, etc., is owned by the municipality or dedicated to public uses. Again, speaking in generalities, municipal control of the public land is obtained through the governmental power of eminent domain, while municipal control over the use of private property is dependent on the exercise of police power. With rare exceptions, eminent domain has nothing to do with zoning; there is no question of compensation to the owner; no question of the necessity of acquiring private property for public use. The constitutionality of zoning depends on whether the restrictions proposed are justifiable under a reasonable use of the police power, a common-law principle which, although undefined and undefinable, finds its backing in certain well-recognized needs of the community. Used conservatively the police power has to do only with injury to health, safety, or morals; used more liberally

[1] Paper presented at the City Planning Division of the American Society of Civil Engineers, Detroit, Mich., October 24, 1924.

[2] Before Mr. Whipple's death he served as professor of sanitary engineering of Harvard University.

it covers, in addition, such matters as the public order and convenience and even extends to what are called the "amenities of ife." With the increasing concentration of people in cities, there is good reason for the widening scope of the police power which has been witnessed during recent years.

Zoning is advantageous to a city in many ways. It tends to stabilize real-estate values, to promote orderly building, to enhance beauty, and to develop local self-consciousness and civic responsibility on the part of the people. Yet, in the face of these benefits, zoning is likely to be declared by the highest courts to be unconstitutional if it cannot be justified under the police power; and although instances may be cited where the police power has been exercised in a constructive manner to promote the general welfare of a community, its preponderant use has been to prevent injury to health, safety, morals, and—the lawyers like to add—"the like." The purpose of this paper is to outline the scientific evidence bearing on the relation of zoning to health.[1]

HEALTH

At the outset it is important to grasp the full meaning of the word "health," to realize that it is more than the absence of disease; that it has a positive quality; and that it has to do with the mind as well as the physical body. It is useful to keep in mind the derivation of the word from the Anglo-Saxon "haelth," which implied wholeness. If one were to venture a definition, it might be said that health is "that state of quality of life in which the body is sound, the various organs function naturally, and the whole organism responds adequately to its environment."

In a popular sense public health means the general or collective health of the community. In an administrative or legal sense it means the health of the community as influenced by factors which affect a considerable number of people in some connected way. The police power is not limited to public health used in this restricted sense, but deals with health. Attention should be called to the fact that the adjective "public" restricts the word "health" instead of amplifying it.

Although it is difficult to define normal health, it is recognized that some factors tend to injure it, or lower its state, whereas other factors tend to promote it, or raise its state above the normal. Normal health

[1] [Since this paper was written the U.S. Supreme Court handed down a decision (Euclid village case, November 22, 1926) which was a victory for zoning. The Court upheld the constitutionality of excluding stores from residence districts, factories from business districts, and apartment houses from detached-house districts.]

presupposes a normal environment, the two ideas being complementary and inseparable. It is the purpose of zoning, as it is that of sanitation, to secure and maintain an environment in which normal human beings can lead normally healthful lives.

In an address on "Sanitation—Its Relation to Health and Life" before the Sanitary Engineering Division of the Society, the writer pointed out that the principal injurious factors to health are infections, poisons, and accidents. The physiological factors air, food, water, light, temperature and humidity, sleep, exercise, clothing, and shelter, and the sensatory factors smell, taste, sound, sight, and touch, are either health promotive or health injurious, according to their nature. This classification, indefinite though it is, serves to steady one's ideas when considering the complicated relations between health and environment.

Quantitatively, health can be measured only imperfectly and in part. Individual health may be expressed in terms of growth, height, weight, and other biometrical units. Community health on its negative side may be measured in terms of death rates and sickness rates, general and specific, for different classes, age groups, and particular diseases. No adequate methods of measuring community health, on its positive side, have yet been developed; perhaps they will come in time.

To a large extent, therefore, the subject under discussion is beyond the range of statistics; and reliance must be placed on accumulated experience and the opinions of competent authorities, rather than on logical scientific demonstration, although, in certain parts of the problem, scientific proof is available.

INDOOR AND OUTDOOR CONDITIONS

The relation between health and indoor life has long been recognized. Laws and ordinances covering the size and ventilation of sleeping rooms, drainage, dark hallways, cellars, windows, refuse disposal, and many other items are common. Detailed building and plumbing codes, housing laws, tenement-house laws, and the like are in force in most cities. It is well recognized by the courts that insanitary indoor conditions are prejudicial to the health of the people. It is coming to be recognized that, in important ways, indoor conditions are dependent on and controlled by outdoor environment. The light that enters a room through a window depends on the light that falls on the outer wall of the building, and this is affected by the position, height, and bulk of neighboring buildings. The quantity of air that enters a building is influenced, sometimes very greatly,

by neighboring buildings, and the quality of the air is affected by what is going on in the neighborhood. In fact, nearly all the physiological and sensatory factors related to health may be used to illustrate the close connection between indoors and outdoors.

Placing restrictions on the height and bulk of buildings is virtually public control of the space outside the buildings. It prevents private owners from monopolizing light and air to which all people should have a common right. In some respects time-honored conceptions in regard to property rights are faulty. It is assumed that lots of land privately owned are bounded by vertical planes which extend upward and downward without limit, unmindful of the fact that, in this latitude at least, the sun's rays fall slantingly on the earth and the winds blow horizontally. Building without limit on one's land, therefore, may interfere with a neighbor's use of his land and the enjoyment of certain bounties of nature, thereby doing injury to his health and comfort. From this point of view restrictions on height and bulk appear to be justifiable.

Conversely, the indoor use of property may affect outdoor conditions. Buildings of great height and bulk lead to such indoor massings of people that not only are the means of ingress and egress provided with difficulty, but means of conveyance and the streets themselves become so congested that safety, health, and morals are jeopardized. Congestion may extend even to the substructures of the streets—the water mains, sewers, gas pipes, and electric-light and telephone wires. Municipal governments, responsible for the streets and their use, cannot adequately perform their duties in the face of excessive developments of private property abutting on the streets. The indoor use of property, whether for residential, business, or industrial purposes, controls the character of the vehicular traffic and the character of the pavements required for it; it affects the cleanliness of the streets, as well as dust, odors, sights, and noises. The abutters and the public have common interests in the streets and public lands, which can be protected only by placing restrictions on the use of private property.

PHASES OF LIFE

One of the primary purposes of zoning is to safeguard the conditions which affect three primary phases of life, namely, work, recreation, and sleep, each of which occupies about one-third of the adult's normal day. Adequate provision for work, sleep, and recreation (using this word in a sense broad enough to include rest and nourishment and not merely as a synonym for pleasure) is essential to health. The necessary conditions are

not the same for all three, although for sleep and recreation they are not dissimilar. The keynote of work is efficiency; of sleep, quiet; of recreation, cheerfulness.

In infancy and old age, and with the sick of all ages, the conditions which favor sleep are especially important. During childhood and youth, when bodies are growing and minds are developing, the recreation phase controls. In middle age, the work phase predominates. To a large extent the three phases of life are controlled by the sun—the day is for work, the night for sleep, and the morning and evening for recreation; but to an increasing extent life in cities ignores the clock. Factories run continuously, night work is required in many ways, transportation never ceases. Those who work at night must sleep by day. What was once a "time" separation is fast becoming a "place" separation. To obtain normal, healthful conditions in cities, home life must be separated in place from work life, and, in order that permanency be given to this separation, a certain amount of governmental control of private property is essential. This is the basic principle which underlies building restriction by districts.

In making this place separation it is necessary to take into account various practical considerations. Many people like to live within walking distance of their work, and the daily walk, if not too long, is one of the positive factors of health. Home life requires that the grocer, the butcher, the baker, and other neighborhood conveniences be not too far away. Certain associated businesses gain in efficiency by segregation. Some kinds of manufacturing involve processes which are noisy or which give rise to odors, bearable during work, but offensive from the standpoint of home life. Cities which have been built under the doctrine of *laissez faire* cannot be rebuilt in a day. These and similar facts have led to the establishment of zones of the most irregular shape, size, and position—zones not always topographically logical, but the best that can be established under the circumstances. The need of zoning is the best argument in favor of city and regional planning.

The primary object of zoning, therefore, is (1) to protect the basic phases of life against injury by providing adequate place separation of residence, business, and industry; and (2) to prevent the private monopoly of natural light and air, necessary to health, by restricting the height and bulk of buildings in ways appropriate to their neighborhood.

With these general principles in mind, various factors involved in the problem, namely, light, air, noise, odors, congestion, and the like, will now be discussed in some detail.

LIGHT

The rays of the sun bring light and heat to the earth, and both are necessary to man's existence. Dr. Haven Emerson, paraphrasing Michelet, has tersely epitomized human experience by saying, "You cannot raise babies any more without light and air than you can raise plants." Although admittedly mysterious in its action, sunlight is of positive biological benefit, and this is true even of diffused sunlight, or daylight. Its action is both physiological and psychological. It is a natural stimulant to the skin and the nervous system. It aids naturally in providing resistance to the body against diseases like tuberculosis. It has recently been learned that it plays an important part in the cure and prevention of rickets in children. It helps to cure tuberculosis of the bones. It provides illumination, the absence of which hampers activities of mind and body and induces eye strain with its attendant damages and discomforts. It provides warmth in winter. Although science has not yet fathomed the influence of the sun's rays (and this influence may perhaps include the rays beyond those of the spectrum of light), it is a matter of accumulated experience that sunlit rooms are not only cheerful, but healthful, and that dark rooms are gloomy and unhealthful.

There are likewise many indirect benefits. Sunlight is a powerful disinfectant, rapidly destroying bacteria exposed to it, whether floating in the air or resting on pavements, floors or walls. Unequal heating of the air induces convection currents and beneficial air movements. Places not exposed to sunlight are more likely than others to contain stagnant air. Air movements have an important influence in regulating the temperature of the body. Stagnant air around the body tends to increase in humidity, thereby making a person feel warmer in summer because of lessened evaporation and cooler in winter because of greater conduction of heat by the moist air.

Sunlight tends to reduce the relative humidity of the air by increasing its temperature and its ability to hold water vapor. By removing moisture from dust particles in the air, it tends to lessen fogs. It also tends to dry pools of water which otherwise might become breeding spots for mosquitoes.

Sunlight markedly influences vegetation. Trees, shrubs, and grass are natural automatic regulators of heat conditions. During the summer trees produce desirable shade, yet, in winter, they do not obstruct the sunlight. In this respect the shade of trees differs from the shade of buildings. Vegetation also provides a natural chemical balance. Human beings,

as well as all animals, inhale oxygen and exhale carbonic acid; whereas plants in sunlight take in carbonic acid and give out oxygen. Vegetation cannot thrive without sunlight and water. It is a matter of history that the increasing height of buildings and the increasing extent of impermeable area due to buildings and pavements drive out trees, shrubs, and grass. The effect of vegetation is local. Trees and grass concentrated in parks cannot take the place of vegetation on streets and individual house lots.

Daylight, which means indirect lighting from the sun by reflection from the sky, the clouds, and various surfaces, does all these things, but to a less degree than direct sunlight. Sunlight may even be too great, as everyone knows, especially during the summer and in the Tropics. Daylight has an important economic value. It is not only beneficial physiologically and pyschologically, but increases the productiveness of labor and reduces the necessity of artificial illumination. Artificial illumination involves expense and must be arranged with great care in order to be effective and not cause injury to the eyesight. Lighting with oil or gas tends to vitiate the air by increasing the carbonic acid and moisture, and even by increasing the poisonous carbonic oxide.

Artificial lighting also increases fire risk. Lack of proper exterior lighting increases the window space required and this, in turn, increases the heat loss in buildings in winter.

There are abundant reasons, therefore, for stating that adequate provision for allowing daylight to enter an inhabited building is essential to human growth, health, vitality, and comfort. Whoever, by building overmuch on his own land, prevents his neighbor from receiving a reasonable amount of light on his land is doing him an injury that properly comes within the scope of the police power.

Much can be done to make the best use of sunlight by the orientation of buildings and streets. Buildings facing the cardinal points are not as well lighted throughout the year as those facing the quarter-points. Western townships with their north, south, east, and west boundaries have tended to grow up into cities having streets in these directions. Many trivial matters often control street orientation, whereas the element of sunlight receives scant attention. The matter does not become one of real importance until high buildings are constructed, and, by that time, street lines have become fixed. Contact with civil-engineering students in recent years has convinced the writer that astronomy receives too little attention in the schools. Few students, on graduation, are able to trace the sun's

path in the heavens at different seasons or to draw the shadow of an isolated house, not to mention the shadows of high buildings on each other, when located on a street of given latitude, width, and direction.

AIR

The necessity of pure air need not be argued. It is a fundamental principle registered by human experience. Modern studies of ventilation emphasize the physical properties of the air—temperature, humidity, and movement—and their physiological importance. These heat relations are closely linked with the problem of sunlight, already considered.

Nothing in recent experimentation, however, controverts the need of cleanliness of the air we breathe. Dust in the air tends to irritate and clogs the breathing apparatus. If the dust particles are sharp, as in the case of silica, they wound the delicate membranes so that bacterial infection is likely to follow. Statistics of tuberculosis among stonecutters show that this disease is prevalent in direct proportion to the percentage of silica in the stone dust. Dust may injure the eyes and clog pores of the skin. Its damage is economic as well as physiological. The extent to which disease germs are transmitted from person to person through the air is not well known. Ordinarily, spray from the mouth or nose does not carry more than a few feet, and accompanying bacteria capable of detection by present methods do not live long in the air because of the destructive effect of drying and sunlight. The behavior of the filterable viruses in air and the longevity of the spores of bacteria, molds, and fungi, however, are only imperfectly understood. Irritating fumes from chemical processes may be not only offensive to the senses, but also cause physiological injury. Any air which by reason of dust or bacteria, irritating fumes, or offensive odors tends instinctively to induce shallow breathing must be regarded as injurious to health. Just as pure air tends to promote health by naturally inducing deep breathing and stimulating the bodily functions, so exposure to vitiated air tends to break down the individual's power to resist disease, especially respiratory affections, such as colds, pneumonia, and tuberculosis. Here the element of time is important. A fleeting bad odor may be offensive, but do little or no injury, whereas some odors, long continued, may be injurious. On the other hand, there are odors to which people become accustomed and which do no damage. Individual susceptibility plays an important part in the phenomenon of odor. The extent to which foul air affects breathing during sleep appears to be not well known from

experimental studies, but, judging from experience, its influence is quite as important as during waking hours.

The air which enters a building, both in quality and in quantity, is influenced by the neighboring buildings and by the streets. Intakes of ventilation systems are more often located with reference to indoor distribution than to exterior conditions which affect the quality of the entering air.

Many studies have been made of the number of dust particles and bacteria in city air, both in the United States and abroad. The absolute figures need not be considered because their order of magnitude varies according to the methods used and the sizes of the dust particles included in the counts. Relatively, the tests agree in showing that dust in the air is greatest near the street and decreases logarithmically upward; that macadamized streets and much-traveled granite pavements produce more dust than streets sheet paved; that dust is closely associated with the cleanliness of the streets and methods of cleaning; that automobile traffic produces less dust than horse traffic, but distributes it to a greater extent; that street cars raise dust one or more stories higher than horse traffic; that less dust is found over grass land than pavements; that less dust is found in residential districts than in business or industrial districts, etc.

Smoke is another important source of dust. The use of oil burners in place of coal burners is changing this problem. The Mexican oils are higher in sulphur than American oils, and their use increases the sulphurous fumes in the air to a measurable extent.

Where high buildings exist, the ventilation of streets is coming to be an important problem. If buildings are high relative to the street width, there is likely to be a stagnation of air over the pavement and a concentration of dust bacteria, foul odors, and automobile smoke injurious to the health of persons using the streets.

The density of automobile traffic in cities is already so great that traffic officers are sometimes overcome by the poisonous fumes of carbonic oxide, and pedestrians are greatly inconvenienced by the smoke. In business districts, where large trucks are used and traffic is heavy, these conditions are especially bad, and are at their worst when associated with high buildings with flat roofs and overhanging cornices. If the streets have a marked grade, there is a tendency for gravity currents to produce partial ventilation with dilution of the bad air; but when they are level, gentle winds do not suffice to effect the necessary ventilation of deep, cavernous streets. Strong winds, on the other hand, produce excessive currents through cavernous streets that are very objectionable in winter.

In the interest of air purity, therefore, zoning is justified. Residential districts, where people sleep and recreate and where children grow up, need protection against the atmospheric dirt of the business and industrial districts.

NOISE

Susceptibility to noise in general and to particular noises varies greatly among individuals. It is a difficult question to discuss. It is well known that noises hinder sleep. Physicians say that certain persons, especially those suffering from nervous diseases, are seriously injured by noise and vibration. Everyone knows that in many ways noises interfere with the comfort and tranquillity of life. Quiet is especially important at night in residential districts and near hospitals and schools.

Noises are greatly increased by the reflection of sound waves from the hard surfaces of pavements and building walls. Limitation of the height of buildings is, therefore, a means of noise reduction. Vegetation, on the other hand, tends to dampen sound waves—another reason for providing conditions favorable for trees and grass in residential districts.

Many kinds of noises are preventable, but others appear to be inseparable from traffic, business, and manufacturing processes. In these cases segregation appears to be the best solution.

CONGESTION

Congestion, or crowding, needs to be viewed from at least three angles as far as health is concerned, that is, room crowding, land crowding, and personal contact.

Room crowding is commonly expressed as a ratio of the number of square feet of floor area, or number of cubic feet of room volume, per person. Minimum limits are sometimes placed on one or both of these ratios for sleeping rooms, barracks, schools, factories, etc., based on the hygienic need for light, air, and ventilation—matters which have already been considered.

Land crowding, expressed as so many persons per acre, introduces two additional elements: The number of stories and the area of the building with reference to the size of the lot and the street width. One of the most important reasons for restricting the height and bulk of buildings by districts is to prevent overcrowding of corridors, elevators, streets, and sidewalks. These have to do more with questions of safety and accident than with normal health—questions not considered in this paper.

The third phase of congestion bears directly on the spread of disease. When people are brought into such close contact that opportunity exists for breaths to intermingle, as in crowded elevators and cars, or for the nasal spray of one person to pollute the air breathed by another, there is serious danger that disease germs may spread and that colds and respiratory diseases may become epidemic. It may be true, as medical bacteriologists claim, that crowd exposure tends to build up an acquired immunity against certain diseases so that to some extent nature protects itself, but the fact remains that, on the whole, crowding speeds up and increases the transmission of disease. It is a menace to health, morals, and safety.

No one has yet established a logical basis of street capacity, either for pedestrians or for vehicular traffic, or the relation which an adequate street capacity should bear to the size of abutting buildings. Most streets in American cities were laid out to accommodate slow-moving traffic and buildings of two, four, or six stories, or thereabouts. Increase in building height has led to serious street congestion in many places. Fragmentary data exist as to the number of square feet per person in buildings used for different purposes, the permissible capacity of elevators, the space occupied by moving pedestrians under different conditions, and the street space monopolized by vehicles of different character moving at different speeds. These data should be assembled and studied with a view to establishing, if possible, some reasonable relation between building size and street area. The writer's unsatisfactory attempt to do this (too meager to warrant publication) has convinced him that the fundamental data need first consideration.

PSYCHOLOGICAL

Health is mental as well as physical. Mental health is intangible, but none the less real. Sunlight is beneficial largely because it is cheerful. Trees and grass and flowers are healthful for the same reason. The beauty of form, color, light, and shade conduce to mental health. Eyes are rested by a change of focus and ears by a change of sound. Monotony causes mental fatigue, and, carried to the yielding point, may cause insanity. Children, especially, need opportunities for proper development and adjustment of the senses, but all workers like to get away from their work at night. A most important benefit of zoning is to provide opportunities for the changes necessary to normal mental health.

COMMUNITY HEALTH

It is easy to object to particular applications of the zoning principle. Building restrictions of necessity must be arbitrary. Boundaries of districts must be actual lines, and in establishing lines where conditions grade almost insensibly one into another, it is difficult to avoid individual injustices. It is often difficult to show that zoning prevents injury to the health of certain particular individuals. There are various matters for adjustment and administration which should be provided for, as well as may be, in zoning laws. Although zoning as a principle has abundant justification under the police power, it must not be forgotten that since Magna Charta, the individual has had protection against undue restrictions of government in what is known as "due process of law."

The relation between zoning and health is a mass relation. It is the health of the community, the collective health of many people, that is at stake. Families rightly separate working quarters from sleeping quarters; cooking and eating and sleeping in the same room is regarded as insanitary. Tenement-house laws, factory regulations, building codes, and the like safeguard the internal uses of the buildings. The zoning law does for a city what some of these laws do for the factories, school houses, and dwellings.

When cities grow without plan, their constituent districts tend to change in character. Single houses give way to apartment houses; residential districts are insidiously invaded by business and manufacturing; and old buildings are converted to uses for which they were not intended and for which they are ill adapted. Converted houses are notoriously likely to be insanitary and unhealthful. In a growing city there is a natural tendency toward concentration for economic reasons. A person who erects an apartment house in a region where only single dwellings exist is capitalizing for his own pocketbook light, air, and the other residential benefits at the expense of his neighbors. A single-house region once infected with an apartment house tends to accumulate other apartments, and the neighborhood tends to change from a stable, house-owning population to a shifting, renting class—a class lacking in neighborliness and civic pride and leading an impoverished family life. Thanks to sanitation and other modern improvements, apartment-house life has been made healhful for adult existence, but the compressed and repressed life of a modern city apartment is not conducive to growth or to a life that is full and rich. Segregation of apartment houses is justified as a measure for protecting community health.

Gradually it is dawning on men's minds that cities which grow to great size do so at the expense of the health and comfort of their own citizens; that rapid growth which outruns municipal ability to make or remake necessary thoroughfares and provide needed public utilities leads to ugly confusion, whereas a slower, well-ordered growth is more likely to lead to civic beauty and a better civilization. The United States is entering on a period of lower population increase. As pride in growth and quantity production lessens, as it must, the elements of stability and self-control and beauty need to be strengthened.

Zoning should be regarded as a sort of collective self-control, a means by which a city controls its own life and growth for the best good of all its citizens. It is an act of police power fully justified in the interest of morals, safety, and health.

SUMMARY

Good city planning aims to bring about order in the physical development of a city, town, or village. In good planning public and private developments are in harmony with the plan. Poor planning usually results from piecemeal planning when the layout of a new subdivision or location of public buildings and so on, are regarded as separate problems. A city plan provides for streets and transportation, business and shopping centers, industrial districts, public buildings, parks, playgrounds, and residential areas. A city plan should include a zoning ordinance. The plan is given effect by both the city government and its citizens, and usually a city-planning commission is set up. Effective city planning can do much to make one-family houses available to more families by encouraging a better distribution of centers of employment and a well-coördinated street system which provides for available areas for dwellings. The city plan makes possible easy access to neighborhood stores, schools, and recreation centers.

After the plan has been formulated it should be kept up to date, as its execution is never completed while the city is growing or rebuilding. A separately organized city-planning commission usually is the desired agency for preparing the plan and in assuming the responsibility for carrying it out. Ill effects on housing by poor planning are: (*a*) lack of forethought in layout of streets often affecting housing through needless high costs of land brought about by too great an amount of paving and installation of utilities; (*b*) failure to orient streets to provide maximum of direct sunlight for dwellings; (*c*) back yards too small for efficient use;

(*d*) more corner lots than necessary in residential districts involving street noises, traffic dangers, and dust.

City planning affects housing through those multi-family dwellings which occupy a large percentage of the land; through progress of building and industry. Too much space is often allotted to manufacture and trade which sometimes results in blighted districts. City planning should concern housing in the clearance of slum areas. City planning affects housing in laws and practices relating to real estate, eminent domain, taxation, and assessment.

More efficient government machinery and community organization is needed in carrying out city planning. A solution of the problem is needed of acquiring land and financing the improvements in order that those benefiting by the improvement will pay in proportion to the benefits received.

A large number of states have enacted legislation that authorizes planning in cities, towns, boroughs, counties, and regions. This is of two kinds: (1) enabling acts that authorize planning in all cities, or cities of a certain class, towns, boroughs, villages, counties, or regions of the state; (2) special acts that affect only certain named cities and areas. Planning commissions have been established in certain cities under these general and special laws. In other states commissions have been established by municipal charter amendments under home-rule provisions of state constitutions or laws. In still other cases commissions have been appointed without specific authorization by the state. A Standard City Planning Enabling Act—a model from which states may frame and develop planning legislation—has been prepared by the United States Department of Commerce.

Provision must be made in the regional plan for industrial, commercial, and residential areas. The metropolitan region of the future should be planned to contain a number of distinct urban communities which will be enabled to preserve their individuality through surrounding open areas. Each urban unit in the regional plan should be easily accessible to the others. Home and work should be brought closer together through intelligent regional planning, and more space should be available which will improve the character of dwellings.

For the population that is to be housed in a carefully planned region there are one-family houses, two-family houses, and multi-family houses, boarding and rooming houses. With this classification of houses, with a regional plan, zoning regulation, and an intelligent distribution of the

centers of employment so that there will be ready access from home to shop, with a stabilization of the character of neighborhoods, a recognition of the value of space inside and outside the house, it will be comparatively easy to develop a housing policy to serve adequately the needs of the population. The regional plan will guide the development of traffic facilities, types of dwellings will be placed in accordance with their needs of these facilities, and zoning regulations will prevent the placing of an inferior type in a district where it does not belong.

A slum is a dwelling, or group of dwellings, or a whole district which is injurious to health, morals or family life. Slums may be due to (1) faulty layout—too narrow streets or too large blocks, inviting courts, alleys, and rear tenements; (2) bad structural plans of dwellings themselves, where they cover too much of the lot and have dark or dimly lighted rooms; (3) disrepair; (4) the tenant. Slum evils may include overcrowding and uncleanliness. Health and housing authorities are responsible for cleanliness and certain repair work. The city planner is concerned with faulty layout or faulty structural plans in respect to light and air.

Slum clearance is the acquisition by city or by authorities of slum areas declared injurious to public health or morals followed by demolition and a new layout of streets and open spaces.

Zoning has been defined as the application of common sense and fairness to the public regulations governing the use of private real estate. Zoning regulations vary in different districts according to the uses of the land for residence, business, or manufacturing. Zoning is an important part of city planning and should be developed with it. A blighted district is a district originally developed for residence or industry in which people have lost confidence. The most familiar is the residential district in which stores and factories have begun to be erected—thus reducing residential property values. Zoning prevents waste by preventing these blighted districts.

A general state enabling act passed by the state legislature is desirable as home-rule powers may not cover all necessary provisions for successful zoning. A city-planning commission, if there is one, is the logical body to initiate zoning work. A zoning ordinance consists of one or more maps dividing the city into different kinds of districts with regulations for each district, and adequate provisions for enforcement.

Municipal control over the use of private property is dependent upon the exercise of the police power. It is the purpose of zoning as it is that of sanitation to secure and maintain an environment in which normal beings

can lead normally healthy lives. Placing restriction on heights and bulks of buildings is public control of space outside of buildings. Indoor use of property also affects outdoor conditions. One of the primary purposes of zoning is to safeguard the conditions which affect three primary phases of life which in turn affect health: (1) work, (2) recreation, and (3) sleep. The objects of zoning are (1) to protect the basic phases of life against injury by providing adequate place separation of residences, business, and industry; (2) to prevent private monopoly of natural light and air necessary to health by restricting the height and bulk of buildings in ways appropriate in their neighborhoods. The relation between zoning and health is a mass relation—the health of the community.

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CHAPTER XX

IMPROVING HOUSING CONDITIONS THROUGH LEGISLATION

HOUSING REFORM AND LEGISLATION[1]

By LAWRENCE VEILLER
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The determination of how best to accomplish housing reform depends a good deal upon one's conception of what the housing problem is; before there can be an adequate discussion of the remedy there must be agreement as to the disease. In other words, we must know what we are going to reform before we attempt to reform it.

There is great variety of opinion on this subject, especially among those to whom it is a new subject. Some people seem to believe that the housing problem is essentially the problem of cheap houses; as they have expressed it, ...

Another group, with their eyes fixed upon the more crowded quarters of some of the larger cities where the problem of moving back and forth the vast throngs who journey from one part of the city to another twice a day is fraught with great difficulties, conceive that the housing problem is the problem of rapid transit, and that if cheap and effective rapid transit could be once provided the housing problem would be solved. This is not a new view.

Still another element believe that the housing problem is the problem of supplying a sufficient quantity of housing accommodations and that anything which tends to encourage the building of more houses will solve the housing problem, the assumption being that people live under bad conditions simply because there are not enough houses to go around.

There is truth in all these views. Each one is a factor involved in the housing problem, but no one of them can be truthfully said to constitute that problem.

The housing problem is the problem of enabling the great mass of the people who want to live in decent surroundings and bring up their children under proper conditions to have such opportunities. It is also to a very

[1] Adapted from *A Model Housing Law* (Russell Sage Foundation, 1920), pp. 3–7.

large extent the problem of preventing other people who either do not care for decent conditions or are unable to achieve them from maintaining conditions which are a menace to their neighbors, to the community and to civilization.

If we accept this view of what constitutes the housing problem we see that it has many sides; that it is not only an economic problem, not only a question of supply and demand and of furnishing a sufficient quantity of homes, but that the kind of home is of vital importance. The assumption that thousands of people live under conditions such as are found in our large cities throughout America because there are no other places in which they can live is not borne out by the facts. There is no use in dodging the question. We may as well frankly admit that there is a considerable portion of our population who will live in any kind of abode that they can get irrespective of how unhygienic it may be.

Housing reform is to be sought in many ways, but chiefly through the enforcement of wise laws; laws which will regulate the kind of houses that may be built, will compel the improvement of the older buildings as they fall into disuse, and will require all buildings in which human beings live to be kept in a sanitary and safe condition.

But legislation is not the only way. Much must be done through education—education of both tenant and landlord, and even of the community itself. The force of example some think will do much, but thus far that expectation has not been realized.

Considerable also can be accomplished by wise management; by the building of houses of a more attractive type; by encouraging the development of Garden Cities; by stimulating those who like country life to live in the country or in the suburbs; by improved transit, thus making it easier for men to live out of town and journey to their work; and especially by the intelligent planning of towns and cities.

But what makes any of us take up housing reform is not primarily the desire to see any of these things brought about, but the insistent demand made by our consciences for the abolition of the slum.

We all of us believe that the conditions under which thousands of our fellow citizens live are wrong and a mockery on civilization, and to many of us the continuance of such conditions seems fraught with menace to our institutions. That the people themselves often have created the very conditions from which they suffer does not alter the situation. The conditions are there and must be dealt with. The one thing that we are all agreed upon is that we cannot afford to neglect them.

The housing problem is therefore essentially the problem of preventing people from maintaining conditions which are a menace to their neighbors or to the community.

Housing evils as we know them to-day are to be found in dangerous and disease-breeding privy vaults, in lack of water supply, in dark rooms, in filthy and foul alleys, in damp cellars, in basement living rooms, in conditions of filth, in inadequate methods of disposal of waste, in fly-borne disease, in cramped and crowded quarters, in promiscuity, in lack of privacy, in buildings of undue height, in inadequate fire protection, in the crowding of buildings too close to each other, in the too intensive use of land.

How are these manifold evils to be remedied? Legislation thus far has proved to be the most effective remedy. The only way that we know of by which such conditions can be ended is through the enactment of laws which will compel the removal of these evils and the substitution of right conditions. This is not theory but the result of the experience of many cities.

Legislation alone, of course, will not do it. Laws must be enforced. Merely getting a housing law on the statute books will not change conditions. Unfortunately, laws do not execute themselves and no law will do much unless an adequate system of enforcement is also provided.

True, it is a painful operation. It takes time and energy and above all things patience. It means constant effort. It means attention to innumerable details. It often means foregoing immediate results to secure larger future returns.

Housing is a commodity like food or clothes, and the methods to be employed in securing the right kind of housing for the people of any community differ in no essential respect from the methods to be followed in providing the right kind of food or clothing for that community. In a city where the children of the poor were dying of typhoid because of impure milk, we should, I think, feel that it was trifling with a serious situation if it were urged that nothing could be done through legislation, but that the only way to insure a better milk supply was to encourage the people to move to the country where they could have their own cows and thus insure the right kind of milk for their children.

The question which every housing reformer must face is: What method will give the largest results with the least expenditure of energy and effort? It is largely a question of emphasis. The method which will return 90 per

cent of results and not 10 per cent is obviously the method to follow. No one thing will in itself solve the housing problem in any community. Housing evils are of so manifold a nature and have so many manifestations that it is, of course, apparent that many things must be done before right conditions can be achieved. There is no method of housing reform which the housing reformer should not adopt provided it will produce results. It must always be submitted to this practical test. In some cases all methods are to be employed, not merely one.

That legislation alone will solve the housing problem is of course absurd. But the point that we wish to lay emphasis upon is that in most cases the largest results have come from legislative action and that until certain fundamental evils have been remedied it is futile, or worse, to adopt the methods of housing reform which may be said to belong to the post-graduate period rather than to the kindergarten stage of a community's development. In other words, we must get rid of our slums before we establish garden cities; we must stop people living in cellars before we concern ourselves with changes in methods of taxation; we must make it impossible for builders to build dark rooms in new houses before we urge the government to subsidize building; we must abolish privy vaults before we build model tenements. When these things have been done there is no question that effort can be profitably expended in the other directions mentioned.

HOUSING LEGISLATION AND ITS ENFORCEMENT[1]

By JAMES FORD
Executive Director of Better Homes in America

The conditions under which people live have a profound influence upon their health, safety and well-being. For their protection it has been found necessary in urban areas to frame comprehensive laws or local ordinances to govern conditions of construction, fire prevention and protection, light and ventilation, sanitation and maintenance of dwellings, both new and old. In the absence of such provisions or where provisions are inadequate, ignorant or selfish builders will erect houses or tenements which will be poorly constructed and depreciate rapidly, and which may even be structurally unsafe, a pronounced fire-risk, and provide inadequately for light and ventilation of rooms and halls, for privacy, convenience and comfort of the tenant.

[1] Adapted from "The Enforcement of Housing Legislation," *Political Science Quarterly*, December, 1927.

Comprehensive housing ordinances have not been passed in American cities, as a rule, until the cities have become fairly large, and adequate legislation was not to be found in any city prior to the beginning of the twentieth century, although quite comprehensive codes were framed in the preceding decades for New York City and several other large municipalities.

The present period of housing legislation dates from the passage of the New York State Tenement House Act of 1901, which applies to cities of the first class—New York City and Buffalo. It was framed chiefly by Mr. Lawrence Veiller, now Secretary and Director of the National Housing Association, and served as a model for housing laws in the rest of the country until the publication by Mr. Veiller of his Model Tenement House Law, and subsequently of his Model Housing Law. The Tenement House Law had covered only such dwellings as were inhabited by three or more families, but the Model Housing Law, first published in 1914 and revised in 1920, covers other types of dwellings as well. Other states, Iowa, Michigan and Minnesota, have adopted the Model Housing Law with very slight changes. The permissive Tenement House Acts for cities and towns of Massachusetts show its influence, as do also the state housing laws of California and Indiana. The State Tenement House Act of New Jersey is based upon the Tenement House Act of New York. In practically every other state in the country housing conditions are governed chiefly by local ordinance, although there are some provisions in state health or fire-prevention acts which have a bearing on housing. Many local ordinances have followed closely the Model Housing Law—as, for example, those of Berkeley, Syracuse, Cleveland, Columbus, Louisville and Hartford.

Except in the State of New Jersey and in New York City the administration of housing laws or local ordinances is vested in local building and health departments. The sections on structure, fire protection, light and ventilation, in case of new or remodeled buildings are enforced by the building department, while the maintenance of healthful conditions and sometimes the plumbing and sanitation sections are left to the health department. In the State of New Jersey and in New York City special tenement-house departments have been created and charged with the enforcement of the above provisions as far as tenement houses are concerned, leaving the enforcement of similar provisions, insofar as they affect one or two-family houses, to local health and building departments.

The advantages of having a uniform state housing act are very great. For a state legislature is more likely to use the services of experts than

smaller cities are; and the provisions of a state act may reach not only the large cities but the smaller ones which would, in the absence of a state law, have no adequate legislation on the subject or no legislation at all. Another advantage lies in the fact that a state law is less easily modified than a local ordinance, and cannot be changed without commanding public attention, thus making it possible for specialists and the "guardians of public welfare" to be heard. Whereas, experience shows that local ordinances may be changed at almost any meeting of the city council without a public hearing. The council may be influenced unduly by arguments of unscrupulous builders who are looking for quick profits and who overlook the interests of the tenants and the general public.

The housing legislation of any given city may include sections of the state housing act supplemented by state fire-prevention or public-safety acts, and possibly, also, as in the case of Wisconsin, the state building code. In addition to the state legislation there may be local building, health, or fire-prevention codes enforced by the building department, health department, and the fire chief or department of public safety.

Enforcement of housing legislation may be inadequate for any of the following reasons:

1. Because the law is not clear or sufficiently comprehensive, or because the provisions for penalties and procedure are inadequate.
2. Because the heads of administrative departments lack the necessary qualifications.
3. Because the appropriations for the enforcing departments are insufficient.
4. Because of the make-up of the Board of Appeals.
5. Because of division of authority.
6. Because of lack of coöperation on the part of the city solicitor and the courts.

To improve the enforcement of housing legislation it is necessary, then, to have an adequate law. The experience of New York City and of the states which have adopted the Veiller Model Housing Law with a minimum of change, such as Iowa, Michigan and Minnesota, demonstrates the importance of the adoption of the many provisions of Article 6, the section entitled "Requirements and Remedies." This section requires the owner or architect to submit his plans to the appropriate department to make sure that they conform to the law. He cannot commence to build until he has received a permit of approval based upon conformity to the law. The second requirement is that the building shall not be occupied until a certificate of compliance has been secured from the appropriate department, and the latter is not issued until the dwelling conforms in all re-

spects to the requirements of the act. Occupation of the building is unlawful until such certificate has been secured.

Drastic penalties are necessary if the act is to be properly enforced, for otherwise the unscrupulous builder will find that he can make money through violation of the law even though he will be brought to court and forced to pay small fines. The Model Law, therefore, provides for imprisonment as well as fines, and for a cumulative penalty for each and every day that the violation shall continue. Civil penalties are also provided for. To protect the enforcing department it is further provided that no officer of that department shall be liable for costs in any action or proceeding that may be commenced in pursuance of the act. The tenants may be evicted if they fail to comply with the maintenance provisions of the act. All fines imposed under the act shall be a lien upon the property.

The owner of property is required to file with the enforcing department a notice containing his name and address and a description of the property, and is permitted to file his agent's name if he wishes. The posting on the premises of a copy of a notice of violation of the act and the mailing of a copy on the same day to each person whose name is filed with the department constitutes a sufficient service of notice, thus making it possible to secure quick action with respect to the violation. The enforcing officer is granted power to make periodic inspection of dwellings, and is required under the Model Law to inspect every multiple dwelling at least once a year. Right of entry is authorized.

In the absence of any of the above provisions, enforcement becomes difficult. Permits to build and certificates of compliance are indispensable, but follow-up inspection is also necessary in order to prevent the making over of one and two family houses into tenement houses after the certificate of compliance has been granted. Stop orders have proved to be a useful supplementary provision under the New Jersey State Tenement House Act and in the building department of New York City. The posting of a stop order on the premises stating the law and the penalties will keep contractors and employees from working on the building or covering up a violation of the law until the enforcing department can arrange to have the violation removed. Frequent inspection during the period of construction is necessary, or otherwise many sections of the law will be violated. The provisions for the registering of the owner's name and for service of summons are necessary, for otherwise ownership may be frequently changed and the owner difficult to reach. Where owners live out of town or are sojourning in Europe (reported by New Orleans and

Chicago) dangerous violations of the law would continue over an extended period unless the enforcing department were empowered to make the necessary changes itself and charge them against the property.

Even where the law is good, it may be poorly enforced if there is weakness in the administrative department. The enforcing official should be thoroughly versed in the subjects of building materials and of construction, housing and sanitation, but he should also be a man of courage and integrity, convinced of the seriousness of his civic responsibility and sufficiently forceful to command the respect of architects, builders and owners, and the respect and coöperation of his staff.

With an adequate law and a competent administrator, enforcement, at least of some of the provisions of the act, is virtually guaranteed. But obviously in the absence of a sufficient appropriation many provisions of the law will prove unenforcible. A striking example of this is seen in the State of New Jersey where the appropriation has never been sufficient to cover all the features of the law. The first Commissioner, Captain Allen, who was one of the most competent housing officials we have ever had in this country, finding his appropriation insufficient, used it chiefly to make sure that all new construction conformed to the law, arguing that he was thereby preventing the recurrence of serious housing conditions in all new buildings. But by concentrating on the new buildings, he did not have inspectors enough provided on his staff to make possible periodic inspection of old tenement houses and the removal of violations of the law. It was a wise decision under the circumstances, but left the tenants of the older tenement houses uncared for unless they had the courage to file complaints. Local health departments in New Jersey, as in other states, do not make regular inspection of all dwellings but inspect usually only on complaint—this is due chiefly to the fact that they also suffer from insufficient appropriation. So New Jersey's law with regard to the periodic inspection of older properties is still inadequately enforced by either the State Board of Tenement House Supervision or by local health departments.

It is probably safe to say that no American city has an adequate force of housing inspectors. New York City is practically the only one which has ever succeeded in having every tenement house visited at least once a year (and New York stopped doing so ten years ago), though in every city there are many tenement houses and private dwellings which should be visited more frequently. Otherwise rubbish will accumulate which will constitute a serious fire-risk, or defects will occur in plumbing or repair

or use of the building, which will menace the health of occupants or neighbors.

In most cities it must be said the training of housing inspectors is poor. They are usually chosen from persons who have taken general civil-service examinations, but have not been given adequate tests of their knowledge of building, housing, or sanitation. In New York City, however, there are special examinations which cannot be taken without special study of the law and of the general principles of housing and sanitation. The textbook by Dr. George M. Price, entitled *Tenement-House Inspector*, is a well-devised handbook for persons who contemplate such an examination, but it is not widely known or imitated through the country. Other American cities have no satisfactory equivalent for this course of training of inspectors but are seriously in need of some device for special training.

Adequate records are essential for the smooth operation of enforcement departments. It should always be possible to find in one place all records appertaining to a given building. This matter has been covered in Mr. Robert E. Todd's pamphlet on *Right Methods in a Housing Bureau*, in the chapter on "Essentials of a Housing Investigation" in Veiller's book, *Housing Reform*, and in Dr. George M. Price's *Tenement-House Inspector*. Detailed questions on five by eight cards of different colors, so that a new building inspection card, violation card, fire-escape card, and so on, can be readily identified and picked out of the files, facilitate smooth operation. As blueprints are bulky and difficult to file, the New Jersey State Board of Tenement House Supervision photographs the ground-floor plan of a new building on a five by eight card and files that photograph with the other records. Violations of the law are also photographed so that if the case is taken to court, definite and convincing proof of the violation will be at hand. This facilitates quick action by the courts and decision in favor of the enforcing department.

Building departments usually have boards of appeal. Veiller contends that they are unnecessary and undesirable in housing departments and tend to nullify the provisions of housing laws by the exceptions which they almost inevitably make. They are unquestionably necessary in cities like Boston where building lots are of every conceivable shape and size, but less necessary in cities where lots are rectangular and virtually uniform in size. It is perhaps true that the boards are usually made up of builders and architects whose natural leanings will be to make concessions to builders, and that there is insufficient representation of the interests of

the sanitarians and general public. On the whole it may be said that the builders are much more likely to make their interests known to the board or the administrative official than the general public is, for the general public usually has no medium through which it can proclaim its needs. . . . .

Another serious difficulty in the enforcement of housing legislation is the division of authority between different departments of the state and city governments. Often the law is obscure, so that it is not quite clear with which authority enforcement of a given section is lodged. Sometimes there is concurrent jurisdiction. In either case, action is difficult. For where department appropriations are inadequate or political influence is strong, neither enforcing official will take the onus and the "buck is passed." This difficulty is perhaps most notably displayed in the provisions concerning the demolition of dangerous buildings. A building gutted by fire can usually be torn down if unsafe, but a building declared unfit for human habitation and vacated by order of the housing or health department is likely to stand for years an eyesore and a menace, used by vagrants or by boys' gangs, and a source of neighborhood contamination. In most cities no department dares to tear it down, and the owner remains indifferent to the "orders" of the department or the clamor of neighbors. Yet public interest demands vigorous and courageous action.

Arrangement for demolition is sometimes made with a contractor who removes the building for the materials which he can salvage out of it. Liens against the property for the cost of demolition are mentioned by several cities. A few others mention collection of costs through taxes. In general, however, it must be stated that enforcement of this section of the law is peculiarly weak or wholly lacking, and that special attention to this problem and the drawing-up of an adequate method of procedure is indicated as necessary. For as our cities grow older, the number of buildings which have outlived their usefulness and are not worth remodeling will increase. The problem will become very serious in our eastern cities during the coming generation.

The one remaining weakness in enforcement of housing legislation lies largely outside of the enforcing department: Namely, in the lack of coöperation of the courts. City solicitors or attorneys may have no interest in housing or may fail to appreciate its importance, and for these reasons or because of political pressure or the pressure of owners, they may postpone court action for a dangerously long time. Judges may similarly lack

interest in or sympathy with the purpose of the law. Yet if the enforcing department fails to win any case, its prestige is seriously affected and violations will be encouraged, and it will be timid about taking cases to court in the future. Unquestionably, the enforcing department is at fault in bringing up a case which has flaws. . . . .

The final essential which should be clear from the preceding discussion is public support for the housing enforcement official and his assistants. It is all up-hill work for a building official or housing official if he is continuously under pressure from builders or owners, and has no support from the community in his attempt to carry out the letter and the spirit of the law. Best enforcement of housing legislation will be secured unquestionably where the enforcing department can feel behind it the pressure of public opinion; but to organize a representative public opinion each city needs a housing association which will have in its membership representatives of each of the local civic agencies which have an interest in problems of housing and home life. Such agencies would include the Chamber of Commerce, civic improvement associations, Parent-Teacher Associations, men's and women's clubs, the local Better Homes in America Committee, the Family Welfare Society, the Visiting Nurses Association, the Council of Social Agencies, the settlements, Building and Loan Associations and perhaps other organizations. A permanent housing association with a salaried executive and staff is the best solution, though not possible in the smaller cities. But a citizens' committee which can make the enforcing official feel their interest and which can call to his attention the progress of housing-law enforcement in other cities and which can always be properly represented at hearings on any matters involving housing will help him to overcome the downward pressure exerted on his efforts by selfish interests, and will make it possible to raise standards of housing and home life until decent, safe, and sanitary housing shall be within the reach of all American citizens.

THE INSPECTION OF DWELLINGS—THEIR CUSTODY AND CARE

By JOHN IHLDER

Executive Director of Pittsburgh Housing Association

. . . . It may be said emphatically that the inspection of dwellings, their custody and care, is regulated by law in the United States. . . . . Housing workers utilize several laws and coöperate with many agencies official and non-official or volunteer. Chief among the laws are: (1) city-

planning laws, (2) zoning regulations, (3) building codes, (4) health codes, and (5) housing laws.

Among the agencies are:

City planning and zoning (*a*) commissions and (*b*) associations—(1) official, (2) non-official. These usually cover a city. Recently their field has been enlarged to cover metropolitan areas. In the near future we shall have state and interstate commissions and associations.

Departments of building inspection, usually municipal.

Departments of public health, state and municipal.

Private or non-official agencies interested in different phases of public health, as the prevention of tuberculosis.

Fire departments, municipal.

Private agencies interested in the prevention and relief of poverty and in immigration problems.

Private agencies interested in community building, as chambers of commerce.

City planning and zoning affect housing directly; the first through providing public facilities and making it more easy for housing developments to occupy new areas, so diminishing the pressure on land; the second through regulating the use of private property and so safeguarding investments in housing. The latter is peculiarly important in a country like the United States where housing is a matter of private enterprise and where government housing is almost unknown. The principal effects of zoning regulation are in requiring open spaces appurtenant to the dwellings and in protecting residence districts against damaging uses. Gradually, with the shifting of population, the newer districts where larger open spaces are required and where non-conforming uses do not antedate the zoning law are drawing the population from the older, more crowded, and more miscellaneous districts. One of the most startling revelations of the 1930 census was the remarkable depopulation of the slum districts of the older American cities.

Zoning regulation, of course, requires constant inspection and reinspection, both to prevent violation and to readjust the regulation in accordance with changing conditions. This form of regulation has swept across the country during the past ten years and to-day the majority of the urban population lives in zoned communities.

Building codes are perhaps the oldest of our housing regulations, owing to the fact that the first American towns were built so largely of wood. Beginning as a means of decreasing the fire hazard, they have been developed until the best of them cover all the factors that affect the structural

safety of the building. It is with structural safety that building codes are concerned, but some of them, especially in municipalities where there is no housing code, include provisions on such subjects as light and ventilation and sanitary accommodations for dwellings. Such inclusion is deprecated by housing workers, for experience shows that the drafters of a building code, having all buildings in mind and being primarily concerned with structural safety, are inclined to set the same standards for a dwelling that they do for an office building.

Building codes are now in force in all the larger cities and in many small towns. One is occasionally surprised, however, to find a city of considerable size that has only the most rudimentary building regulations and no effective inspection. Inspection is concerned chiefly with the building while in process of construction. Later the building is inspected by the Health Department, which will be described; by the Fire Department to note and remedy hazardous conditions; and by the Department of Building Inspection when complaint is made by a citizen or a private organization that it has become unsafe. On the basis of its inspection the Building Department may then order the owner to make the building safe or to demolish it. If he fails to obey, the Department may demolish the building and assess the cost to the owner.

Health departments cover a wider field. To them is given supervision over sanitary conditions as well as the control of inspections and contagious diseases. So, except in a few cases where there are separate housing departments, such as the Tenement House Department of the State of New Jersey and the City of New York, enforcement of the housing code, where there is a housing code, or of such housing regulations as do exist, is given to the Health Department. This enforcement it may exercise through a Bureau of Housing or of Sanitation. Affiliated with this Bureau in the Health Department may be a Bureau of Plumbing Inspection, though logically one might expect plumbing to be assigned to the Building Bureau.

The inspection work of the Health Department begins with examination of the plans for a new dwelling to assure that proper provision is made for light, air, and sanitation. It continues through the erection of the building to assure that the approved plans are carried out. Up to this point it has worked in close coöperation with the Department of Building Inspection. At this point, however, the latter Department usually ceases unless again called in by a complaint. But the Health Department continues. Theoretically the Health Department makes periodic inspections

of all dwellings. Practically it confines itself to the poorer sections of the city. It probably gives particular attention to tenement houses (three or more families under one roof) as compared to one-family houses, experience having shown that insanitary conditions tend to predominate when there is congregate living.

There are health departments in all parts of the country, but the attention they give to housing varies from fairly adequate to none at all. In some states, as in Pennsylvania, the State Health Department has definite though limited authority with respect to housing and includes housing work on its program.

The inspectors of all these departments give some instruction to tenants as well as to owners. Those of the Department of Building Inspection come least into contact with tenants; those of the Fire Department more frequently, those of the Health Department most frequently. The last, therefore, have most opportunity to give instruction and in the best departments make use of it. The effectiveness of this instruction varies. When it consists merely of brusque orders the effect is little. When, as in Cincinnati, Ohio, it is part of a carefully thought-out program of creating a sense of responsibility on the part of the tenant and of promoting mutual understanding between tenant and landlord, it is much more productive. In Cincinnati the housing inspectors—in this case representing the Building Department instead of the Health Department, one of those exceptions that make so difficult any generalization—mark their approval of a dwelling kept in good repair by the landlord and in good order by the tenants, by hanging in its hallway a placard expressing this approval.

But housing work in America cannot be adequately described in terms of official agencies or official action. Where there is the best housing work, there is also a non-official or citizens housing association. This association is an expression of public interest and in turn creates a public opinion that supports public officials. The effective work of the official housing inspectors in Cincinnati is largely due to the existence of the Better Housing League, an agency supported by private contributions and without any official connection. The League carries on its work chiefly through visiting housekeepers whose purpose is to instruct tenants in the poorer parts of the city. When these visiting housekeepers note violations of the housing, sanitary, or building codes, the League notifies the appropriate city department, which forces correction. The League also participates when recalcitrant owners resist compliance with official orders and appeal to the

courts. In one recent case it was instrumental in winning an important court decision that ended a long struggle with a slum landlord.

The Better Housing League illustrates again the lack of uniformity in America. An older organization, the Philadelphia Housing Association, with the objective of improving housing conditions throughout its community, uses quite different methods. It has no visiting housekeepers. It is perhaps more interested than the League in such things as city planning and zoning. Its emphasis is more on transportation, economics, engineering. Its executive calls himself a "housing engineer."

One of the youngest organizations, the Pittsburgh Housing Association, differs from both, at least in the emphasis it puts on different phases of its work. It too has no visiting housekeepers, but its inspectors, while seeking violations of the housing, sanitary, and building laws, do give information rather than instructions. The Association, moreover, definitely considers itself a social agency, and it constantly seeks to coöperate with other private social and health agencies. Its representatives give lectures to the staffs of such organizations as the Visiting Nurse Association, the Family Welfare Society, the Children's Aid Society, the Mothers' Assistance Fund. It distributes to the staff members of these coöperating agencies detailed housing information. In this way it hopes to secure from them a service more effective than it could itself perform because of their constant and intimate contacts with the families.

These local associations work closely with the local municipal authorities. Some extend beyond their city boundaries. The Better Housing League and the Pittsburgh Housing Association extend their activities to the metropolitan regions of which their cities are the center. The latter is organizing practically autonomous housing councils in the smaller neighboring cities so that pressure brought to bear on local municipal officials will be brought by their own constituents, not by an agency in a different municipality.

In Pennsylvania there is also a state association with which the Pittsburgh and Philadelphia associations coöperate. This state association drafted a permissive model housing law that was enacted by the state legislature, and it is now campaigning to induce the cities and towns of the state to adopt it and to secure more vigorous enforcement of state sanitary laws. In Massachusetts a State Housing Association has just been organized. In Michigan another has been in existence for some time, but so far has confined its efforts to the neighborhood of Detroit. From other parts of the country come reports of additional associations in process of or-

ganizations, for the past three or four years have seen a reawakening of housing interest that had been dormant since the war.

From what has been said it is evident that housing inspection is a local activity and that its legal powers are derived from the state governments, of which the cities are creatures. The national government does, however, play a part. The national government has complete power over the District of Columbia, i.e., the city of Washington. The national Congress is the city council of Washington. Outside the District of Columbia, however, the functions of the national government, so far as housing regulation is concerned, are those of an informative or educational and a facilitating agency. Its part in housing has, therefore, been advisory. President Hoover, when he was Secretary of Commerce, created an advisory committee on zoning and city planning and another on building codes. Both of these have issued draft laws with explanatory texts that have been made the basis of state and local legislation. . . . .

Again, as in local affairs so in national there are private or non-official organizations that express public interest and that help to formulate policies and guide executive action. There is the National Housing Association with headquarters in New York, and Better Homes in America, with headquarters in Washington. The latter has carried on an educational campaign by means of Better-Homes contests, that has reached every section of the country and has been largely responsible for the reawakened interest in housing.

NEW YORK'S NEW HOUSING LEGISLATION

The new housing legislation known as New York's Multiple Dwelling Law, which was enacted by the 1929 session of the New York state legislature and which replaced the Tenement House Law of 1901, has received so much comment that a brief summary of this law by Lawson Purdy, a member of the commission which drafted it, is included in this chapter.

THE NEW YORK MULTIPLE DWELLING LAW[1]

BY LAWSON PURDY

During the last twenty-seven years the tenement-house law has been amended about one hundred and fifty times. Many of the amendments were inserted to meet special cases and to make compliance with the law somewhat easier or less expensive. The old definition of a tenement house

[1] Adapted from "The New York Multiple Dwelling Law," *National Municipal Review*, May, 1929.

which has endured for sixty years and over, that of a building in which three families or more live independently and do their own cooking, served well until cooking by gas and later cooking by electricity had been invented and servants' wages had been multiplied by four and rents had been multiplied by three. People who formally demanded and used apartments of eight rooms or more and kept one or more servants now occupy apartments of four rooms or less and keep no servant.

The erection of new buildings almost stopped from 1914 to 1921. There was a severe housing shortage. Old single-family houses could be altered under the building code, not the tenement house law, for non-housekeeping use. Old single-family houses could be adapted without structural alteration for occupancy by people who were not supposed to cook but who did cook on the premises. Hotels were erected, called apartment hotels, which could exceed in height and in lot coverage a tenement house, could have windowless bathrooms and windowless stairs, and therefore be erected to house more people for less money than a tenement house. When plans for such hotels were filed, the architect or builder was required to make an affidavit that no housekeeping was to be done on the premises. Leases were made commonly by which the tenant was required not to cook.

This statement applies to the hotels, to the altered single-family houses, and often to the old houses not structurally changed. Prospective tenants were invited to examine the apartment, observe the sink and refrigerator and gas or electric outlet, and then invited to sign a lease by which they obligated themselves not to cook.

By 1927 so many thousand people were living in houses of various kinds in which cooking was being carried on contrary to law that the enforcement of law seemed almost impossible. An autocrat who did not live in the city might have enforced it perhaps. It is questionable whether such a person could who traveled about the town without police protection.

For a number of years the Tenement House Committee of the Charity Organization Society, the Housing Committee of the Brooklyn Bureau of Charities, and the few others interested in maintaining the integrity of the tenement house law had a very hard struggle to prevent objectionable amendments and to encourage any kind of enforcement. The tenement house department had been hampered by inadequate appropriations and an insufficient staff. On the other hand, the real estate boards were besieged by members who urged amendments to the tenement house law of

various kinds which, if enacted, would have weakened the law seriously. At this juncture the real estate boards recommended the appointment of the commission. The commission had before it the task of preserving the standards of the present law and meeting the demands of those who wished to cheapen construction.

The task of the commission was set for it by the demands of those not satisfied with the present tenement house law. There were those who wished to erect high and bulky buildings as apartment hotels with fewer stairways, without windows to the outer air, with windowless halls and windowless bathrooms. The contention was and is that with mechanical ventilation bathrooms can be better ventilated than by windows, and that electric lights are more efficient than daylight. Owners of houses which had been altered under the building code wanted them legalized for housekeeping. Owners of old single-family houses wished an inexpensive method of alteration for tenement-house use. The demand for cooking anywhere or everywhere was universal.

On the other hand, those who had a primary interest in the welfare of the poorer people of the community contended that windowless bathrooms for them meant dirt and disease; that unlighted stairs and halls were a social menace and that the altered old houses constituted a serious fire hazard. Moreover, for all buildings they contended that more light and air made houses better investments, better for both owners and tenants. They regarded the limit of height of one and one-half times the width of the street for fireproof buildings as being too high rather than too low. At all costs they wished to preserve the general structure of the tenement house law and its administration by a separate department.

One of the first conclusions of the commission was that the old definition of a tenement house which depended upon cooking had to go. Unlawful cooking was too easy. For that reason the title of the act was changed to Multiple Dwelling Law. Under this law cooking will be permissible in any multiple-family dwelling which conforms to the law in all other respects. The rules for construction, for height, for bulk were made the same for the tenement house and the apartment hotel. A distinction was made in favor of transient hotels, but the effort was made to lay down rules for construction of the transient hotel and the other multiple dwellings as nearly as possible alike and to make the differences such that a builder would not be tempted to call his building a hotel when, in fact, it was to be used as a tenement house.

One of the most difficult problems was to meet the demand of those

who wished to build the apartment hotel, which can now be built to a greater height than a tenement house and covering more ground than a tenement house and, at the same time, secure adequate light and air. The plan of the multiple dwelling law is to increase the area of the yard and courts and to allow a slightly greater height. The increase in the yard and court dimensions for a six-story building is about 25 per cent over the dimensions of the present law. The new yard is 15 feet as compared with 12 feet. The outer court is $7\frac{1}{2}$ feet instead of 6 feet. An outer court between wings of the building is 15 feet instead of 12 feet. On a 60-foot street the present tenement house may be 90 feet high, the yard at least 15 feet in depth throughout the entire height of the building, and the courts based on the yard width.

The multiple dwelling law requires the yard to be 20 feet deep at the 90-foot level; above that level the depth of the yard must increase in the ratio of three inches for each foot. Above the 90-foot cornice line on the street front, the building must set back from the street in the ratio of three to one. The maximum height is three feet plus one and three-quarters times the width of the street and never over 175 feet exclusive of a pent house set back on all sides. On a 60-foot street, therefore, the maximum height is 108 feet. In effect, we have allowed two additional stories and required those stories to set back in return for an increase of $33\frac{1}{3}$ per cent in the dimension of the yard. A careful study shows that rooms on the lowest stories will get about the same light on the street front as under the present law, and considerably more light in rooms opening on the yard and courts.

In non-fireproof buildings stairs, halls, and water-closets must be lighted by windows of required size. In all fireproof buildings with passenger elevators water-closets supplementary to those required by law may be mechanically ventilated and in such fireproof multiple dwellings in which every room opens directly upon a public hall, water-closets may be mechanically ventilated. In such buildings stairs and halls may be without windows. The number and width of stairs are determined by the number of rooms on each floor instead of by the number of apartments as at present. The reason for this change is that the size of apartments is, on the average, much less than formerly. Outside fire-escapes are not required for fireproof buildings, but two interior stairs are required except for buildings not exceeding six stories high with not more than twenty rooms on a floor using that stair.

Transient hotels in which there are six or more power passenger eleva-

tors, built in a block zoned exclusively for business, may be erected to any height and to any bulk permitted by the local zoning ordinance.

Houses heretofore altered in accordance with the building code are required to do very little to make them more safe. Houses hereafter altered are required to have water-closets with a window or skylight and to be safeguarded adequately against fire. Lodging houses and rooming houses have some requirements in excess of those now contained in the local ordinance.

The tenement houses erected prior to 1901, called old-law tenement houses, are subject to some additional regulations for sanitation and fire protection

The provisions for the enforcement of the law are strengthened.

The problems presented to the commission have been solved. The solutions offered will not please everyone. To one who, like myself, believes that no building should exceed the width of the street in height and no windows should have less than a forty-five-degree angle of light, the provisions for light and air seem inadequate and they are far less than should be adopted by any city which can by any diligence do better, but for the city of New York, as it has been allowed to grow, I believe the provisions of the multiple dwelling law represent a solution of pressing problems which must be solved, and do afford more light and air for all houses over four stories high and adequate light and air for houses less than four stories high, and that the bill presents rules for construction that are practical and will be good for both owner and tenant.

SUMMARY

No one thing in itself will solve the housing problem but in most cases largest results have come from legislation. The enforcement of the legislation is as essential as the legislation itself.

Only a few states have housing laws. A few others have provisions in state health and fire-prevention acts which have a bearing on housing. In most of the states housing is governed by local ordinance, and enforcement is vested in local building and health departments. A state housing act has many advantages: (1) Provision is made for smaller cities which undoubtedly would have no legislation. (2) A state law is less easily modified than local ordinances. (3) There is no opportunity for unscrupulous builders to influence city councils.

The housing legislation of a city may include sections of the state housing act, supplemented by state fire-prevention and public-safety act and

possibly the state building code. In addition to state legislation there may be local building, health, and fire-prevention codes enforced by building, health, fire chief, or department of public safety. Housing-legislation enforcement may be inadequate for the following reasons: (1) inadequate laws; (2) heads of administrative departments poorly qualified; (3) too small appropriation for enforcement; (4) make-up of Board of Appeals; (5) division of responsibility in enforcement; (6) lack of coöperation between city solicitor and courts. Adequate legislation and heavier penalties are necessary for improvement.

There is undoubtedly an inadequate housing-inspection force in nearly all American cities, and inspectors often are poorly qualified. Adequate records are essential, and all records concerning a given building should be recorded in one place. Division of authority between departments of state and city government is a serious difficulty in housing-legislation enforcement.

Housing associations sponsored by groups of citizens have been organized in a few cities. These associations promote legislation and assist in enforcement. Public support for housing officials is essential for more adequate enforcement. The chief laws affecting housing legislation are city planning, zoning regulation, building codes, health codes, housing laws. The chief agencies concerned in the inspection of dwellings are city-planning and zoning commissions, departments of building inspection, public health (state and municipal, private or non-official agencies interested in public health), fire department (municipal), private agencies interested in the prevention and relief of poverty and immigration.

The best building codes cover all factors affecting structural safety, and some in municipalities where there is no housing code include provision for light and ventilation and sanitary accommodations for dwellings. Building codes are now in force in all large cities. Health departments supervise sanitary conditions. Except where there is a separate housing department, enforcement of the housing code is given to the health department.

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CHAPTER XXI

IMPROVING HOUSING CONDITIONS THROUGH HOUSING DEVELOPMENTS

HOUSING DEVELOPMENTS

Most houses are built through private enterprise. However, a number of housing projects have been carried out which show improved housing conditions. The most outstanding of these recent developments—those begun or completed during the past decade are the two developments of the City Housing Corporation of New York City—Sunnyside and Radburn, the Brooklyn Garden Apartments, the Paul Lawrence Dunbar Apartments for Negroes in the Harlem district, and the Amalgamated Clothing Workers projects, all of New York City; the Marshall Field Garden Apartments and the Michigan Boulevard Apartments (the latter for Negroes), both of Chicago; and Mariemont of Cincinnati. With the exception of some of the houses of Sunnyside, and those of Radburn, and Mariemont, the dwellings are all of the multi-family type. These projects and others of note are housing enterprises that illustrate good housing at reasonably small and moderate cost.

The state of New York has endeavored to encourage low-rental housing, and in 1926 a law was enacted to provide for limited-dividend companies. The following paragraphs from "The New York Law for Formation of Limited Dividend Companies" in the *Monthly Labor Review* of July, 1926, states some of the provisions.

. . . . The law provides for a State board of housing and for the formation of public limited-dividend corporations, the former to plan and supervise and the latter to undertake actual building projects. The State board is to consist of five members, appointed by the governor and serving without salary though receiving actual expenses. They are to study housing needs throughout the State, investigate alleged monopolies of building materials, prepare plans for housing projects, supervise the activities of limited-dividend corporations, appoint one member of the board of every such corporation, and exercise other supervisory and consultative functions.

The public limited-dividend corporations must consist of at least three members. The rents for housing erected by them must not exceed, in New York City, $12.50 a room per month, the bathroom not being counted as a room.

Outside of the city the maximum is less, running down to as low a figure as $9 per room per month. Their dividends are not to exceed six per cent per annum. Should returns reach a figure which, after proper allowance for maintenance, depreciation, etc., would justify a higher dividend, the rents are to be lowered proportionately.

In order that these corporations may secure the land needed for the large-scale operations necessary in order to reduce costs, they are given the right of eminent domain. This power is not to be exercised except upon the specific authorization of the State board, which is not to give the authorization unless, after public hearings on the plan proposed by the corporation, it is apparent that there is urgent need for the accommodations which the corporation intends to provide and that the condemnation is in the public interest.

Public limited-dividend corporations are required to furnish, through the actual sale of stock for cash, one-third of the total cost of any project undertaken, the remainder being secured through bonds bearing five per cent interest on first mortgage and 5½ per cent on debenture bonds. No project may be undertaken without the approval of the housing board.

The corporations are to be exempt from the payment "of any and all franchise, organization, income, mortgage recording, and other taxes to the State, and also from all fees to the State or its officers." The bonds and mortgages of such corporations, together with the interest thereon and the dividends on the stock, are exempt from State taxation. The State can not exempt the corporations from local taxes on the buildings and improvements, but it empowers municipalities to do so and provides that whenever a municipality takes advantage of this permission the buildings and improvements shall be to the same extent exempt from State taxation.

Provision is also made for the formation of private limited-dividend housing corporations, which are not to have the power of eminent domain, but whose buildings and improvements are to be tax free so long as they remain in the hands of the corporation. Public limited-dividend corporations are not permitted to dispose of property once acquired nor to make any real-estate transfers. Private corporations organized under this law will, however, have this privilege.

[NOTE.—The Amalgamated Clothing Workers projects, the Brooklyn Garden Apartments, and the Farband projects are examples of tax-exemption experiments provided for by state and city legislation for apartments not exceeding a rental of $12.50 per room per month.]

RADBURN[1]

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The problems presented by new planning for towns and cities and regions are so numerous, so complex, so intricately interlaced with all the other problems of our modern life, that to attempt even so much as to catalogue them would prove a difficult task for the technical town planner and the result would be nothing to the layman but a dismay and a hopeless horror. Being myself a layman and not a town planner, for the purposes of this paper I shall select but a very few of the problems that at this time may interest both the technician and the layman, and in discussing them confine myself to the experience, realized and impending, of Radburn. I indulge the hope that in the discussion to follow light may be thrown upon these and related problems from the experience gained in other places.

It seems necessary, therefore, since I am to draw upon Radburn for illustrations of the few problems I am to outline, to give in a few words the setting of the Radburn scene.

Radburn we call the town planned for the motor age. It is a town only in the sense that it is, or will be, an urban community. Politically, it is a part of the Borough of Fair Lawn, in Bergen County, New Jersey. Geographically, it lies within the North Jersey sector of the metropolitan region of New York, quite near the industrial cities of Paterson and Passaic, the residential city of Hackensack and the suburban town of Ridgewood. Topographically, it is situated on rolling land within sight of distant hills, and lies from fifty to a hundred and more feet above sea level. Historically, it has been the home for nearly three centuries of a sturdy folk of Dutch origin, the influence of the Hollanders having been kept fresh in each generation by new immigration from the Netherlands, and two of the principal fixed highways which we found ready-made to our hand in Radburn are plainly to be seen on the maps prepared for General Washington by the geographer of the Continental Armies. Socially, the background has been entirely agricultural, the community life finding its home in the Grange Hall, the accepted standards being highly individualistic and the contacts with New York very largely only through the economic nexus of Gansevoort Market.

[1] Adapted from *Some Problems in New Planning* (address, National Conference on City Planning, Buffalo, June, 1929). Bull. 4. New York: National Conference on City Planning, 1929.

The historical and social background is of little account in considering our present problems, except for the prime fact that it is responsible for the wide expanse of farms cut only by a few widely separated narrow roads, leaving this tract here, within fourteen miles of Times Square by air line; within seventeen miles of the Jersey City Terminal of the Erie by railroad, and within ten miles of the Jersey end of the new Hudson River Bridge, a virgin territory upon which a new town plan might be laid with a minimum of difficulty in adjusting the scheme to existing streets and structures.

This, then, was the site selected by City Housing Corporation upon which to build its new town planned for the motor age. It is unnecessary here, I am sure, to say that City Housing Corporation is a limited-dividend company formed five years ago by Alexander M. Bing and a group of associates for the purpose of building better homes and better communities, or that its first experiment at Sunnyside Gardens in Long Island has proved a success. Mr. Bing, his associates and his advisers, were, I believe, inspired by the example of the garden cities of England and desired to do something looking in that direction within the New York region. Here the permanent agricultural belt was not practicable and Radburn is not to be, in the strict sense, a garden city.

Radburn will occupy the lands purchased by the City Housing Corporation, two square miles; and probably will extend in influence if not in precise pattern to the adjacent lands owned by others. It is to be a city of from 25,000 to 30,000 people.

So the scene is set.

The persons of the drama have been assembled by City Housing Corporation. Responsible for the enterprise, its financing and its major decisions, are Mr. Bing and the Board of Directors. Clarence S. Stein and Henry Wright, architects associated, are the town planners. They have had as consultants Frederick L. Ackerman, Robert D. Kohn, and Thomas Adams. To carry the whole into execution the City Housing Corporation has its own staff of administrators, construction executives, engineers, lawyers, and the like. Many experts in the field of municipal government, recreation, health, education, and so on have been consulted. To attempt to apportion among so many the responsibility for particular features of the plan, physical or community, is not within the scope of this paper.

From amongst the maze of problems presented in Radburn or encountered there, I shall select but three to talk with you about. First, the street and park pattern; second, the division of the town with respect to use,

residential, commercial, and industrial; and third, the governance of the town and its community organization. No one of these can be exhausted nor all of its implications considered: I shall give but the bare bones.

I. A PATTERN FOR STREETS AND PARKS

I do not know for what the checker-board street pattern was planned. Perhaps for the horse and buggy. Perhaps for the convenience of the engineer. Perhaps for the handiness of the 25- by 100-foot lot. Perhaps it just happened. At any rate it is the conventional and usual pattern for streets in our American towns. Its relation to the pattern for park lands is usually incidental.

In Radburn, to be planned deliberately for the motor age, two things were chiefly to be desired: First, the maximum convenience for the use of the motor car for business and pleasure; and, second, the reduction to the minimum of the dangers attendant upon such use. Consideration for the health and happiness of the people who were to live in the houses also brought the problem of the provision of park spaces into the foreground.

To a town, the street system is both the skeleton and the circulatory system. The street itself has many functions, above, beneath and on its surface. But aside from drainage, its principal surface functions are three in number. Two of these are ancient, classic and first to come to mind when one hears the word "street." They are the functions of traffic—traffic awheel and traffic afoot. Usually we separate the parts of the street devoted to these two functions; run a raised ribbon along either side of the street, call it a sidewalk, and devote it to foot traffic; pave the wider strip in the middle and devote it to wheeled traffic; however, mingling the two at intersections some sixteen or eighteen times in a mile. When urban land is intensively used, the surface of the street has a third important function, and we have found no way to separate a part of the street for this new use. It spills over the sidewalk and the roadway. It is play. Play in the streets is dangerous to children and an impediment to wheeled traffic and the attempt to use the same space for both brings tragic consequences into thousands of American homes every year.

At Radburn, in its residential portions, the planners have redistributed the functions of the street, they have made a new segregation of street space, and they have rearranged the relation of street space to park space.

Essentially the scheme is based on the use of a unit which, for lack of a better name, we call the super-block. The super-block consists of a central core of open park land rimmed by a public street devoted entirely to

foot traffic or play, this core being surrounded by a series of lanes or culs-de-sac, short streets devoted entirely to wheel traffic, closed at the interior end, but open to and connecting at the outer end with the wide highway which surrounds the whole super-bloc and which is again devoted exclusively to wheel traffic.

The houses are grouped around the lanes, so that each house fronts upon two streets, one a relatively wide street for wheel traffic and the other a quite narrow street for foot traffic. The great motor highway surrounding the whole super-block sends its tributary streets inward toward, but not to, the park core; the footway rimming the park sends its tributary sidewalks out to the outer rim.

The central park core and its rimming footway send out arms to the boundary, and there the footway and a ribbon of parkway dive under the motor highway through an underpass to connect with the park and footway system of the next super-block.

In this manner the footways and the motorways are quite separated. Groups of these super-blocks in their turn will center about a school and playfield as the focal point, and to this school and playfield any child may walk from his home in comfort and in entire safety, so far as the threat of the motor car is concerned. And yet each house has its motor street, too, and most of them have a garage built into the house, as much a part of the house as the dining room.

This means that instead of grouping the park lands according to any usual manner, they have been distributed throughout the residential parts of the town.

The effect may be observed from the angle of the householder. He has two fronts to his house. One gives upon a public street dedicated to the municipality and devoted to wheel travel. The other opens upon a public street, also dedicated to the municipality, and devoted to foot travel. He will not be, in any case, farther away than four hundred feet from the principal motor highway. And he will not be farther away, in any case, than four hundred feet from a park. The closer he is to one the farther away he is from the other, of course, but it is never more than four hundred feet.

If for any reason his child plays away from his own yard, whether for companionship, for leadership, or just for fun, the child has a place to play in the park and on the footway where no motor vehicle can menace him. If he plays in the motor street and gets run over, it will not be because no other place has been provided for him.

I am bold enough to predict that the planners in Radburn have

opened the way for a revival of pedestrianism as a pleasant form of exercise. Think of taking a walk in town to-day—step down from this curb, wait a minute for the traffic signal to change or else dart out amongst the speeding cars, up on the curb on the other side, and then repeat, sixteen or eighteen times a mile at each intersection. In Radburn one will be able to take a walk, say in another year, and stroll for some miles on a sidewalk without ever stepping down from a curb or up onto a curb and with-

FIG. 75.—An attractive group of houses at Radburn planned and spaced for sunshine, ventilation, and attractiveness. (Designed by Clarence S. Stein; Richard Averill Smith, photographer.)

out ever being in a place where a motor car can be—and all the time on a public street lighted by public lighting but bordering not a wheel-traffic roadway but a park.

That such a radical departure from the conventional street pattern had an interesting effect on house design follows as a matter of course. The house has two fronts, no back. It has two front yards, no back yards. It has two principal entrances—a motor entrance and a pedestrian entrance. These things have improved the opportunity for designing small

houses in groups for the wider vision and at the same time have added to the opportunity for design for each house seen as a single unit. That the architects and builders already have taken advantage of many of these new opportunities for the moderate priced houses that have been built in Radburn is evident to the visitor at the first glance.

This new street and park pattern has justified itself also on the score of economy as well as with respect to safety, convenience and beauty. The

FIG. 76.—Here are the rear views of the Radburn houses, or what is termed the "lane side" of the houses. (Clarence Stein, architect; Richard Averill Smith, photographer.)

scheme requires less land for the streets than the conventional checkerboard and the land thus saved goes far toward providing the park space. The grouping of the houses tends to shorten the lines of the utilities, thus introducing further economies, so that we may say that the new pattern saves rather than spends.

II. COMMERCE AND INDUSTRY

Thus far I have talked only of the residential sections of Radburn. Radburn is planned for a population on the land now owned by the City

Housing Corporation, of about 25,000 people. In a sense it is designed as a satellite city. It is not to be, according to plan, a mere dormitory for New York and for the neighboring cities of New Jersey, but is to have its own commercial and industrial sections, and to be, as far as is possible, a self-contained town in which workers may live near their work. At the southerly end of the town a definite reservation for industry has been made, although as yet only one establishment has been built there. The planners have been at pains to relate that industrial section to the other portions of the town by adequate highways and will provide suitable housing for workers not far away.

The commercial needs of the town are to be provided for in local community shopping centers, in sub-business centers, a part of one of which already has been constructed, and in a central business area related to the civic center of the entire town.

Definitive plans are not so far developed for this chief center as in the case of the residential portions of the town, but certain things are to be provided. One of these is open space, both in wide streets and in parks. Another is the convenient approach by traffic ways to local business places without interfering with rapid through traffic. And another is to find in a measure the soothful answer to that deep and passionate longing of the modern American; he who sings:

> This is the place I long have sought,
> And mourned because I found it not:
> —A place to park!

Here again the use of the interior of the block in a new relation to its perimeter will, we believe, be useful, economical and not ugly. The business blocks will have a central core of parking space or garage space, bringing parking close to the store, as in the residential area the green park was brought close to the home.

There is no zoning ordinance in the Borough of Fair Lawn, and therefore the use of the police power to control the uses of property is in abeyance.

In Radburn it is planned, for the present at any rate, to accomplish zoning by contract. The restrictions in the deeds of houses sold as residences and the restrictions to which the whole lands, park and otherwise, in the residential sections are subjected, forbid the use of the land for any but residential purposes.

Sites for industrial purposes have been sold and will be sold subject to

certain restrictions as to the type of industry—excluding the nuisance types—and subject to certain architectural control and community obligations.

Commercial property—stores and the like—will not be sold but will be retained by the City Housing Corporation as an investment, and also because this is the only means that has been suggested for effectively controlling the number and type of stores.

Commercial property of other kinds—such as office buildings for public utilities and the like—will be sold subject to restrictions which in sum amount to zoning by contract. Such a system of use zoning requires, of course, much thought, and makes a heavy draft upon the pre-vision of the planners. On the other hand, it admits of a refinement of zoning that under the police power might very well be questioned in the courts as being too arbitrary.

So here again, in this field of zoning-by-contract, there seem to be possibilities for increased convenience, decreased costs and added beauty.

III. GOVERNMENT AND COMMUNITY ORGANIZATION

Another of the many problems which we have considered is that of local government and the organization of the community life.

Radburn as a city of 25,000 people is perhaps ten years in the future. A year ago it was, except for some lands bought, some money risked and some blueprints, altogether in the future. At the present moment, however, Radburn is in being. About two hundred single-family houses are under construction, half of them nearly completed. A store and office building is almost finished. There are some miles of streets and footways, of water pipes, sewers, gas mains, electric lines, and the like. Parks and playgrounds are nearing the stage of usability.

In short on what were last August nothing but fallow fields now there is a town in sticks and stones.

As yet it has few people. There are a few pioneer families already living in Radburn, almost before we were quite ready for them. To these people and to those who come after them, Radburn is not a housing project nor an essay in town planning. It is a town in which they have bought a house in which to make a home. From their point of view the municipal housekeeping problem is both imminent and immanent.

They are the beginnings of a living social entity which will be known by the name of Radburn. Politically, they are citizens of the Borough of Fair Lawn, and after the necessary time of probation, will be voters in

Fair Lawn. .The borough has an area of a little more than five miles, about one-third of which is Radburn. (The Radburn property extends also into two other boroughs, Glen Rock and Paramus, but most of it and all that presently being developed is in Fair Lawn.) The borough has a population of about 5,500, and nearly 2,000 votes were cast in the last local election, an indication of a lively political interest. The government under the Mayor and Council has been very friendly to the Radburn project, and this spirit of coöperation seems to actuate all factions and parties of the local community.

But a borough so largely rural could not provide at the beginning the full measure of municipal services required by Radburn. It is to be borne in mind that when we undertake to build a planned city such as Radburn on an urban scale on land that heretofore has been entirely agricultural, we accelerate the normal process of evolution by telescoping through two well-defined stages—the semi-rural and the suburban.

In Fair Lawn there was no public water supply, no sewage system, and but meager provision, according to urban standards, for police and fire protection, health service, and the like. In the field of education the situation was much better, a good school system being provided.

For the protection of the property and for the nurture of the community life, several things had to be provided. One was the machinery for enforcing the protective restrictions of the deeds, giving architectural control in the community interest, use-zoning and so on. Another was to supplement the municipal services being provided by the Borough so as to meet the needs of the more intensively developed Radburn section. The third was to provide certain services not yet within the scope of the municipal activities.

To accomplish these purposes, the Radburn Association, a membership, non-profit corporation, was set up. It has accepted the responsibility of enforcing the restrictions incorporated in the deeds and the declarations of restrictions. It has taken title to the park lands to be held for the use of the people of Radburn. It has undertaken to provide supplemental municipal service—as for instance in the case of garbage, where the municipality provided one collection per week and the Radburn Association supplements it by another, giving twice a week collection.

. . . . In Radburn the town planner has dared and the builder and financier have enabled him to do this thing: To prove in a living city that *Design* and *Control* will make for greater health, greater convenience,

greater economy and greater beauty than ever can be realized by *Drift* and *Complacency.*

THE AMALGAMATED CLOTHING WORKERS PROJECT

One of the outstanding coöperative housing developments is that of the Amalgamated Clothing Workers of New York City.

The first project of this organization was completed in 1927 and an extension begun the next year. The two projects provide 511 apartments which are from two to seven rooms in size. The rent for the first project was $11 per room per month, that of the second, $12.50. The following paragraphs from the *Monthly Labor Review*[1] describe the development. A description of the methods of financing of the first project are as follows:

The idea of the actual provision of dwellings for its members by the Amalgamated Clothing Workers was first broached at the 1924 convention. In 1925 a group of union members imbued with the coöperative idea formed the Amalgamated Clothing Workers Corporation for the purpose of purchasing ice and coal for the members of the Amalgamated Credit Union. The purchase of coal was in due time begun and is still being conducted.

This corporation which had been formed for the purchase of ice and coal was utilized in the housing project. Through it, purchase was made in April, 1925, of a plot of gound costing $315,000, and this organization has directed the entire housing project. Ground was broken on Thanksgiving Day, 1926; the first two buildings were ready for occupancy November 1, 1927, the third December 1, and the fourth December 15, 1927. A celebration of the first five buildings was held December 25. The sixth building was ready for occupancy some time in March, 1928, and work on a seventh is about to begin.

The union in undertaking this project was actuated by the desire to show that low-rental housing was possible if undertaken by a group. Care was taken to secure a site which would give the advantages of the suburbs while at the same time being easily accessible to the downtown district.

As one of the predominant ideas was the provision of plenty of light and air, as well as play space for the children where they would be safe, the buildings are, roughly, in the form of a hollow rectangle. Only 47 per cent of the ground is occupied by the buildings; the remainder is in lawns and playground space in an inner court 556 feet long which extends the full length of the property and varies in width from 51 to 100 feet.

They are five-story, walk-up apartments, the elevator being the only modern feature not installed. This was omitted in order to keep down maintenance and operating charges and to make low rentals possible.

[1] "Housing Activities of Labor Groups," *op. cit.*, August, 1928.

The financing of the building project was a problem of considerable proportions. The union emphasizes that although no union funds were used, more than \$1,400,000 was spent on land and construction before any attempt was made to secure money from outside sources, Of this amount \$479,000 was paid in by the tenant owners, \$250,000 was obtained from the Forward Association, and \$172,000 from the Amalgamated Bank on first mortgages. The remainder of the \$1,400,000 was obtained from the following Amalgamated subsidiaries: The Chicago and New York banks of the union, the Amalgamated Center (Inc.), the Amalgamated Clothing Workers' Credit Union, the Russian-American Industrial Corporation, and the Paramount Holding Corporation. In each case the Union acted as guarantor of the loan.

On the security of the buildings a 20-year loan of \$1,200,000 was obtained from the Metropolitan Life Insurance Co., the company taking a first mortgage.

It is estimated that the six-building group will cost about \$1,825,000—\$315,000 for land and \$1,510,000 for construction—or about \$1,500 a room and approximately 40 cents per cubic foot. This average includes the rooms built for communal purposes. Of this amount \$1,200,000 is covered by the loan from the Metropolitan Life Insurance Co., leaving \$625,000 to be supplied by the tenant owners. When all of the 1,185 dwelling rooms have been paid for at the rate of \$500 per room, \$592,500 will have been so paid in. The balance will be raised by the issue of 6 per cent preferred stock, which, it is said, will constitute "a sort of junior mortgage." This stock will be sold to the tenants, the union, and to "other friendly organizations."

Savings were possible in various ways. In the first place, the land was purchased at about \$2 per square foot.

Lower rates were obtained on the actual building operations because of the fact that the contractors, knowing that the work was a cash job, did not add the usual amount for financing. Competition between builders, because of this cash feature and the size of the project, also was a factor in reducing costs. The magnitude of the contracts is shown by the fact that the excavation and foundation contract totaled \$180,000, masonry \$279,000, plastering \$167,000, and plumbing \$134,000.

The loan from the Metropolitan Life Insurance Co. was obtained at a rate of 5 instead of the 5½ per cent customary for loans of this sort. This saving is estimated at \$97,865 for the whole period of the loan (at \$5,000 per year). All of the usual recording fees, revenue stamps, etc., were waived by the authorities and by the insurance company.

But the most considerable of all sources of saving was the exemption of the buildings (not the land) from taxes, under the State housing law. The actual saving to the corporation due to this exemption amounts to approximately \$30,000 a year, or \$2.11 per room per month.

How the $11 room was possible.—It is estimated that the yearly cost will amount to some $150,000, divided as follows:

	Per Year
Operating cost (labor, light, heat, insurance, repairs, administration, etc.)	$47,400
Interest	60,000
Amortization of first mortgage (begins February, 1929)	20,000
Taxes (land only)	5,000
Dividends, at 3 per cent, on common stock	18,000
Total	$150,400

This will average about $10.50 per month per room. As the rent is set at $11, it is seen that "the margin of safety is admittedly low and makes no allowance for vacancies." It is stated, however, that the 3 per cent dividend on common stock may be withheld for a few years; also that since the amortization of the first mortgage did not begin until 1929, the 1928 allotment for that purpose will create a revolving fund of some $20,000 for the redemption of the stock of those who may wish to withdraw.

The union states: "Financing this project was no paltry job. It brought vexing and difficult problems. Having met them successfully we have gained the knowledge and experience which will make it easier for us to extend our housing program here as well as in other cities."

The purchase of dwellings in these coöperative apartment houses is not confined to members of the Amalgamated Clothing Workers, but is open to any trade-unionist in New York City. Amalgamated members are, however, given preference over workers in other trades.

Each prospective tenant must pay $500 per room, of which one-half must be paid at time of purchase. For this he receives stock in the Amalgamated Clothing Workers Corporation equal to the amount of his purchase. Thus if he buys a three-room apartment he receives stock to the amount of $1,500, if a four-room apartment, stock to the amount of $2,000, etc.; and a perpetual lease to the apartment of his choice.

In addition to this he pays "rent" of $11 per room per month. From the amount paid in rents each month, a certain sum will be put away to pay off the mortgages, other amounts to cover expenditures for repairs, renovations, etc. As the mortgages are paid off, in the course of time, the rents will be reduced.

In many cases the prospective purchaser was unable to gather together the $250 per room required as a down payment. In such cases, assistance was extended in the way of loans through the Amalgamated Bank, or the Amalgamated Clothing Workers Credit Union. The Jewish daily, *Forward*, also assisted materially by advancing an amount of $100,000 from which loans were extended to would-be purchasers.

In order to prevent speculation, a tenant who wishes to withdraw from membership in the corporation must sell his stock back to the corporation, which will allow him its book value at the time of withdrawal. Subleasing of apartments is prohibited.

Prospective tenants must be accepted by the stockholders' membership committee before being admitted to ownership in the apartments.

The affairs of the Amalgamated Clothing Workers Corporation are administered by a board of directors representing the tenant owners and including a representative of the State Housing Board.

The various activities within the buildings are managed by committees of five, elected by the tenants. There are three of these committees: The house committee, which looks after the operation and maintenance of the buildings; the business committee, whose duty it is to see to the buying of ice and milk, the running of the stores, the maintenance of the bus, etc.; and the social and educational committee, which arranges the social affairs, has supervision over the library, play rooms, etc. In order to coördinate the activities of these committees, the building committee has representatives on the other two.

The rent and the down payment of the second project as stated below varies somewhat from that of the first.

Two members of the State housing board purchased the land on which the buildings will stand. This plot has been transferred to the Amalgamated Clothing Workers, which, through a subsidiary organization, the Amalgamated Dwellings (Inc.), will supervise the construction of modern apartment buildings for the occupancy of persons of moderate means.

It is stated that the buildings will be equipped with electric refrigerators, incinerators, elevators, and "every other modern improvement." The buildings will occupy only 59 per cent of the ground space.

These buildings being erected on the coöperative plan, each tenant will be required to make an investment of $500 per room, of which $150 per room must be forthcoming as a down payment. The other 70 per cent of the investment can be borrowed from the Amalgamated Bank of New York, the sum so borrowed to be repayable in 10 years. At the end of that time the tenant will own his apartment, and will have to pay only the expenses of operation and upkeep.

The monthly rental will be $12.50 per room. This is more than was charged for the Amalgamated apartments in the Bronx, where the average rental per month was $11, but the union explains that this was necessary because of the higher cost of the land on which the new buildings will stand.

It is reported that in connection with the apartment houses there will be a coöperative service corporation, through which the tenants will buy their supplies, similar to the one in operation in the Bronx apartments.[1]

[1] *Ibid.*, April, 1930.

THE PAUL LAWRENCE DUNBAR APARTMENTS

The Paul Lawrence Dunbar Apartments for negroes located in the Harlem section of New York City which is a John D. Rockefeller, Jr., experiment is a step forward in housing for negroes. The apartment building contains 511 apartments consisting of 2,400 rooms. In less than six months after the apartments were opened the entire number had been

FIG. 77.—Paul Lawrence Dunbar Apartments for Negroes, Harlem District, N.Y.—a John D. Rockefeller, Jr., project.

sold. Only the tenants can be stockholders, and each tenant is required to subscribe for an amount of stock equivalent to the cost of his apartment. A $50-per-room down payment is required. The following paragraphs from "The Housing of Harlem,"[1] by Alfred Alexander, describe the financing method:

The method of financing this project is as follows: No attempt has been made to take advantage of tax exemption. The buildings were erected at an actual cost of land and building including architect's fees, insurance and taxes during construction, together with 5 per cent interest on the money which was ad-

[1] *Crisis*, October–November, 1928.

vanced, of $3,330,000. No charge was included for financing other than 5 per cent interest nor was any charge made for the services of Mr. Rockefeller's staff in developing the whole project. These services are being continued without charge, including a large amount of bookkeeping and other statistical work.

. . . . The tenants pay an average of $14.50 per room per month, of which approximately 54 per cent is principal and interest on account of the cost of the apartment and 46 per cent is for upkeep, taxes, insurance and other charges. It is calculated that in a period of about 22 years the tenants will have paid for the entire project, including the land, and will then have in their possession not a bundle of rent receipts of no value, but an equity in the apartment that will average for each tenant over $6,600.

THE MARSHALL FIELD GARDEN APARTMENT HOMES

These apartments, conveniently located, provide for 628 families at an average cost of $15 per room per month. Each apartment has bath, outside light, and air and faces a street or a garden court. The following paragraphs are from the Marshall Field Garden-Apartment Homes report:

The rooms are spacious, the average living room being 17×13, the dining rooms 12×15, the bed rooms 11×13, and the kitchens 8 ×10. The buildings are fireproof, with concrete base soundproof floors.

The kitchens have the very latest equipment, including cabinets, gas ranges, mechanical refrigeration, combination sinks and wash tubs, and dumb waiters for service deliveries. The modern basement laundry rooms are supplied with modern wash tubs, gas stoves and dryers, and electrical connections for washing machines.

Every apartment has a full-size bathroom equipped with built-in tub, medicine chest and up-to-date fixtures, for which no rent is charged. Those apartments designated as 3½ rooms and 4½ rooms have half-size dining alcoves, instead of full dining rooms, and these are charged for in the rental scale at one-half the monthly rate of full rooms. The average monthly rent per room, based on a carefully prepared estimate of operating expenses and a 5 per cent return on the actual cost of the development, is $15.00. Apartments vary in desirability, however, so that the actual range of rents will run from $13.00 to $16.50 per room per month. It will be possible, therefore, to obtain 3½-room apartments at $55.00 per month; 4-room apartments from $52.00 to $66.00; 4½-room apartments at $72.00; 5-room apartments from $70.00 to $82.50; and 6-room apartments from $84.00 to $97.50.

THE MICHIGAN BOULEVARD GARDEN APARTMENTS[1]

The Michigan Boulevard Garden Apartments of Chicago represent the realization of an idea conceived by Julius Rosenwald. They are the first

[1] Adapted from "Good Homes for Negroes in Chicago," *Housing*, December, 1930.

practical experiment made on a large scale to improve housing conditions for the Negroes of that city.

Fig. 78.—Chicago's Michigan Boulevard Garden Apartments for Negroes—a Julius Rosenwald project.

A report at the end of the first 6 months of 1930 showed an occupancy of approximately 98 per cent, while the net income for this 6-months period was at an annual rate of about 6 per cent on the capital stock, depreciation and all other items of expense having been charged to the operation and cost of the building.

Mr. Rosenwald in commenting on this, and on the fact that bad debts over the period were only $\frac{1}{8}$ of 1 per cent, said recently:

It is now a little more than a year since the completion of the Apartments and I would like to record the feeling of satisfaction which is mine, due to the splendid results of our great venture. By results I do not have in mind primarily the financial side—important and desirable as that is—but more particularly the fine type of tenants which fill the buildings. So far as I have learned, there has been little or no friction between the tenants and the management or among the tenants themselves. This is highly gratifying, and I think great credit is due to the effectiveness of the Community Association and the Board of Advisors, who represent the tenants.

Those living in our Apartments have proven that the Negro is a law abiding citizen and a desirable tenant. In so doing they have added to the prestige of their race and have tended to encourage the investment of money in kindred projects, since it is known that such property is likely to receive the sort of treatment that might be expected from the best class of people, regardless of race. I have been especially impressed with the quiet that prevailed in the court —an indication that those who occupy the building must respect one another's rights.

Therefore, I take this opportunity to express my gratification concerning the first year's operation, and the assurance of my appreciation for all that has been done to prove that my faith in the Negro is justified.

The Michigan Boulevard Garden Apartments, occupied entirely by Negroes, consists of 421 apartments of 3, 4 and 5 rooms, representing an investment of $2,700,000. The building occupies less than 40 per cent of the land, the remainder being laid out in beautiful gardens, courts and a playground for small children. Two nursery schools are run in connection with it, one for the children of the mothers who work and must be gone all day, and the other, for children whose mothers are at home. The building personnel, including the manager, is made up of Negroes.

The apartments are a great deal more than a group of well-designed and well-managed buildings. They constitute almost a little city in itself with highly developed community activities, making for the development of a neighborly spirit and providing convenient educational and recreational facilities for children.

Tenants in the Michigan Boulevard Garden Apartments automatically are members of the Coöperative Community Association. The Building is divided into 11 units of 3 stairways each; each unit elects from its number a chairman who represents the members of the group on a Board of Advisors. This Board meets periodically with the Management to dis-

cuss proposed improvements and community activities. Mutual understanding is thus established between the tenants and the management and individual complaints are being reduced through suggestions from tenants' representatives to those in charge.

One of the outstanding activities for adults is the Sunday afternoon Forum bringing interesting speakers to the community. Subjects of widespread concern are discussed under leadership of well-informed men and women.

There are men's clubs and women's clubs; chief among them the Men's Athletic Club for men desiring participation in active sports; and the Women's Club for all women interested in service to the community, in educational programmes, and in social activities.

The Recreation Department answers the play needs of children of school age by providing outdoor playground activities, such as active games and sports, and indoor playroom activities, such as handicraft, art work and library facilities. This programme, which is carried on under the supervision of a recreation director, affords the children wholesome association and normal recreation.

Working with the recreation department whose programme is designed for boys and girls there are the Girl Scout and Boy Scout organizations which offer many and varied opportunities for character building and recreation combined.

The Nursery Schools represent the most modern and approved methods of training the child of pre-school age in desirable living habits. They make available to parents advice concerning the handling of behavior problems through individual conferences with the teachers, through parents' meetings, and through selected reading material that can be borrowed from their libraries. This service is rendered to all parents.

MARIEMONT, OHIO—A NEW TOWN BUILT TO PRODUCE LOCAL HAPPINESS[1]

By JOHN NOLEN
Town Planner, Cambridge, Mass.

Through the beneficence of a wealthy, wise, and public-spirited lady, Mrs. Mary F. Emery, of Cincinnati, and the energy, good judgment, and idealism of the manager of her estate, Mr. Charles J. Livingood, also of Cincinnati, a new demonstration town has taken shape in the immediate environs of Cincinnati. In honor of the founder, the new town bears the

[1] From *American Civic Annual.* American Civic Association, 1929.

name of Mariemont. The Mariemont Company, the builder of the town, is incorporated under the laws of Ohio, with an authorized capital of $5,000,000.

The site for Mariemont was selected primarily for its natural beauty, near a large city, yet in the country, and away from objectionable factories. It is a location where there will always be plenty of fresh air, sunlight, and healthful surroundings, on a good loam and gravel soil, providing excellent drainage. It is near enough to Cincinnati so that residents in Mariemont can enjoy the splendid cultural opportunities which have made Cincinnati a favorite place of residence ever since it was named "The Queen City." The site of Mariemont is of such a character topographically, and it is so situated geographically, that it cannot become a large city nor in any way rival Cincinnati in city attractions. Its people, however, will enjoy what the citizens of Cincinnati enjoy—the May Festival, symphony concerts, the municipally owned University, the Art Museum and Art Academy, its famous "Zoo," and its facilities for professional services of the first rank.

Mariemont is intended, first of all, as a place of residence for a wide range of families of different economic grades. Its projectors believe that artisans, operatives, and workers generally, for whom it is principally intended, would prefer not to live under the shadow of the factory, so long as they are not too far from their work. For this reason there are to be no industries directly within the limits. But Mariemont has two large industrial sections nearby, both of which will be provided with all the public utilities and conveniences, such as sewers, water, gas, electricity, and telephones, as in the town proper, and under the same control. Sites will be allotted to large enterprises of suitable character only. Mariemont South is directly on the Pennsylvania Railroad and the Norfolk and Western, in the bottom-lands along the Little Miami River. Westover, the more important industrial section of 40 acres, is on the same level with the town, though somewhat distant from it, and separated by a forest growth that will screen the residents from any noise or smoke.

Mariemont did not set out to be a complete garden city in the English sense. It has never claimed to be "an ideal" community nor to be "model" in all respects. Yet it is generally conceded that no other American town is so complete or so perfect from the garden city or garden suburb point of view. Mariemont covers a tract of about 365 acres and provides for a town with its Village Green and public buildings, stores, amusements, school-sites, churches, playgrounds, parks, and complete and attractive

housing accommodations for wage-earners of different economic grades. The normal lot size for the detached houses ranges from 50 to 80 feet frontage, with a depth of 120 feet. The houses are provided with all modern conveniences, including electricity and steam heat from a central plant. Adequate provision has been made for the permanent maintenance of the property as a complete town. Mariemont is not a laboratory for sociological experiments in the problem of housing, and therefore does not follow the English plan of copartnership building and ownership. It is the belief of the projectors of Mariemont that the people in this country are still individualistic in their attitude and action, and do not readily take to cooperative housing schemes. But Mariemont is not an industrial village nor a company enterprise. It is not designed for any special class or workers nor for workers solely. Mariemont is not a philanthropy, nor in any sense paternalistic. Mrs. Emery, its sponsor, attempted to show in a very practical way her interest in the proper development of home-life and home-ownership. She manifested intense interest in the church, the school, the parks, the playgrounds, and the hospital, all features on which the higher life of the community and its public welfare depended. The Mariemont Memorial Church, a lovely English Norman building, has been erected alongside an ancient burial-ground as a memorial to the first settlers in this part of Ohio. These first settlers were a sturdy, God-fearing people who would have built it themselves had they not been too busy raising crops and repelling Indian marauders. Maps are extant showing than an Indian village, large for the times, occupied the southwest section near what is now Dogwood Park. There is a famous Indian burial-ground here. What became of these people no one seems to know definitely, but there are, fortunately, many remaining proofs of their culture and prosperity which will soon be displayed in the Mariemont Indian Museum on the site.

The Dale Park Public School was the first building constructed to provide for education and entertainment in Mariemont. It was erected in 1925, is absolutely modern in planning and equipment, and of Colonial architectural design, to harmonize with the quiet character of the homes facing it. The school has been so located that the children can easily, in a few minutes and with safety, walk to it, for there are no trolley lines to cross, and very little traffic. Between this school and the Memorial Church there is a special "green" for pageants and outdoor entertainments.

Mariemont is not only a town built "for the motor age," but to meet other modern requirements. It has many cul-de-sacs which are called

"places." All wires are underground. A central heating plant provides steam heat for most of the village. The houses are of permanent material, beautifully designed by a score or more of well-known architects from various parts of the United States. The village has been incorporated under the laws of Ohio, has its own town government, with a Mayor, Board of Aldermen, and City Manager plan. The charter for the village is based upon suggestions made by the Rockefeller Bureau of Municipal Research.

Finally, it should be added, Mariemont is more than a demonstration of far sighted town planning and good housing. It is a community with its own social spirit. It has its Community Club, its Parent-Teachers' Association, its Men's Club, its Christmas parties, Fourth of July celebrations, and its community dinners.

Mariemont is a fine example of what Gerald Stanley Lee calls "a million dollars having a good time."

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PART III

ORGANIZATIONS ENGAGED IN HOUSING AND HOME-IMPROVEMENT WORK

CHAPTER XXII

GOVERNMENTAL AND OTHER EDUCATIONAL ORGANIZATIONS

BETTER HOMES IN AMERICA[1]

BY JAMES FORD

Executive Director of Better Homes in America

Prior to 1922 the subject of home improvement had already commanded the attention of the Extension Service in the U.S. Department of Agriculture in rural communities and of the National Housing Association in cities. There had been, also, many experiments by industrial corporations for housing their employees, and large scale enterprises for small-house construction by the United States Housing Corporation to provide good housing for workers in war industries. Commercial "Own Your Home" exhibits and newspaper and magazine publication of plans of small houses had helped to call public attention to the possibility of home-ownership and home-building. These efforts were, however, each of them very limited in the territory which they covered or each dealt with only a few of the phases of housing or home life instead of treating the problem comprehensively.

The need was apparent for a nation-wide movement which would command the attention and the service of civic leaders of all communities, urban or rural, to study their local problems of housing and home-life and devise programs for the promotion of building of new homes to meet the shortage occasioned by the war and the improvement of old homes and their premises, to encourage the more general use of labor-saving equipment, the use of more artistic home furnishings, and the development of home-life with reference to high standards of wholesomeness and achievement. It was through the inititiative and vision of Mrs. William Brown Meloney, who was then editor of *The Delineator*, that this movement got its start.

President Hoover, who was then Secretary of Commerce, was deeply impressed with the need of a popular movement to encourage home-building and home-ownership and agreed to serve as president of the new

[1] "How National Attention Was Directed to Better Homes in America," *American Civic Annual* (American Civic Association, Inc., 1929), pp. 37–43.

organization, to be known as "Better Homes in America." Mr. Coolidge, who was then Vice-President of the United States, became the Chairman of the Advisory Council, which was made up of certain members of the Cabinet, chiefs of several Government bureaus, and presidents of National civic organizations interested in one phase or another of home improvement. Thus, the work of Government departments and of volunteer committees, established by Better Homes in America, could be coordinated for greater effectiveness, and from the Government point of view the new volunteer committees would serve as a local medium through which the bulletins and other services of the Government departments could be made to reach community leaders, and through them all citizens in need of advice or help which the Government could render.

During the years 1922 and 1923, the Better Homes in America Campaign was conducted under the direction of Mrs. William Brown Meloney and financed by *The Delineator*. Five hundred or more communities were reached by the programs during these two years, and a most earnest and unselfish attempt was made by Mrs. Meloney and the owner of *The Delineator*, Mr. George W. Wilder, to conduct a campaign strictly for public benefit.

By the fall of 1923 it was evident, however, that the campaign had reached such proportions as to warrant incorporation on a National basis, independent of the magazine which had originally sponsored it. A three-years' grant was made by the Laura Spelman Rockefeller Memorial Foundation, which was subsequently extended, and the headquarters of the movement was moved from New York to Washington, in January, 1924. Mr. Hoover continued as president of the new organization, of which Mrs. Meloney now assumed the vice-presidency; Dr. John M. Gries, Chief of the Division of Building and Housing of the U.S. Department of Commerce, served as treasurer; and Miss Grace Abbott, Chief of the Children's Bureau, Edwin H. Brown, President of the Architects' Small House Service Bureau, and George W. Wilder, were among the members of the Board of Directors.

The purposes of the movement were stated as follows:

1. To make accessible to all citizens knowledge of high standards in house-building, home furnishing, and home life.

2. To encourage the building of sound, beautiful, single-family houses; and to encourage the reconditioning and remodeling of old houses.

3. To encourage thrift for home-ownership, and to spread knowledge of methods of financing the purchase or building of a home.

4. To encourage general study of the housing problem and of problems of family life, and to help each community to benefit from its study.

5. To encourage the furnishing of homes economically and in good taste.

6. To supply knowledge of the means of eliminating drudgery and waste of effort in housekeeping, and to spread information about public agencies which will assist housekeepers in their problems.

7. To encourage the establishment of courses of instruction in home economics in the public schools, and particularly the construction of home economics cottages and home-management houses where girls in our public schools and colleges may, by actual practice, learn the best methods of conducting household operations and of home-making.

8. To encourage the building of small houses by boys of vocational schools or vocational classes of public schools, and instruction in house upkeep and repair; so that the boys of the community may acquire an intelligent interest in the problems of householding and home-ownership.

9. To promote the improvement of house lots, yards, and neighborhoods, and to encourage the making of home-gardens and home-playgrounds.

10. To extend knowledge of the ways of making home-life happier, through the development of home music, home play, home arts and crafts, and the home library.

11. To encourage special study and discussion of the problem of character-building in the home.

With the help of the Extension Service of the Department of Agriculture and the State Parent-Teacher Associations, the State Federation of Women's Clubs, the State Supervisors of Home Economics, chambers of commerce, and other civic organizations, leaders were picked in cities, towns, villages, and rural districts to serve as chairmen of local Better Homes committees. In the intervening years the number of such committees has grown from 760 in 1924 to 7,279 in 1930. Each community chairman is urged to place on his or her local committee representatives of each of the civic and educational organizations of the community that are interested in any specific phase of home improvement, and as far as possible to secure the cooperation and advice of leading local architects, builders, home economists, landscape gardeners, and other specialists.

Programs for the study of local housing conditions and for lectures and discussions on home-ownership, home-building, home-financing, gardening, and related subjects are characteristic features of all Better Homes campaigns. Ordinarily, the local movement heads up in National Better Homes Week, which of late years has been the last week in April. Many hundreds of the committees, however, conduct year-round programs.

Home-improvement contests are conducted by the majority of Better Homes Committees, but take many forms as they may cover improvements of all aspects of the home or may consist of a group of special competitions for kitchen improvement, living-room improvement, home-gardens, home landscaping, boy's room and girl's room contests, and so on. Architectural drawing contests for best plans of small homes have been conducted in many states; and, beginning with the State of Massachusetts in 1928, general contests for the best examples of good architecture in houses already built, new or old, have been conducted on a state-wide basis, with the help of local representatives of the American Institute of Architects.

In many hundreds of cities and counties each year the central feature of Better Homes Week is the demonstration of one or more houses of good design and construction completely furnished on a predetermined budget proportioned to the cost of the house, and with grounds carefully planted and landscaped. Many of these demonstration houses are designed by the local committee with the help of local architects, or make use of plans issued by the Architects' Small House Service Bureau (a non-profit organization established by the American Institute of Architects to provide plans of well-designed houses of from three to six rooms at minimum cost). Other committees borrow for demonstration the best available small house built by local contractors or owners. In rural communities where there is little need for new building, the demonstrations are usually of old houses which have been remodeled or reconditioned to illustrate that appropriate improvements in the comfort, convenience, and beauty of homes can be made at relatively slight cost. Not infrequently the remodeling of such homes becomes a community project—members of the committee, school boys and girls, and interested citizens from all walks of life, take part in the actual work of painting, papering, carpentry, and decoration.

Among the notable Better Homes Campaigns of recent years, Santa Barbara, California, has been outstanding for its demonstrations of scores of new houses built largely from plans drawn in small-house architecture competitions, and constructed at a cost averaging about $5,000, though ranging from $1,500, for a three-room house, to $10,000 and more for houses of seven or eight rooms. These programs have been under the direction of Miss Pearl Chase, Director of the Community Arts Association of Santa Barbara, and have been supplemented by garden contests, border-planting contests, and a variety of other contests, and frequent public tours of prize-winning homes and gardens.

In Greenville, S.C., the Better Homes demonstrations, year after year, have been conducted through a local committee backed by the Woman's Bureau of the Greenville Chamber of Commerce. New homes and reconditioned homes for persons of moderate means have been supplemented by demonstrations of the best available types of homes for industrial operatives and for Negroes.

At Little Rock, Ark., the demonstrations are annually sponsored by the City Federation of Women's Clubs, and, like those of Greenville,

FIG. 79.—A home-builder's clinic where problems of home financing and home building may be discussed is one of the many Better Homes projects. (Clinic at Kohler, Wis., Better Homes demonstration.)

S.C., have included homes for Negroes as well as for whites, and homes for families with incomes of various sizes.

The home economics departments of public schools and colleges have frequently taken over the direction of local Better Homes campaigns with the coöperation of citizens' organizations. In scores of instances, new houses have been built as the central feature of the demonstration which would serve after Better Homes week as permanent home-management houses for the use of students of home economics. The selection of the

plan, as well as the selection and arrangement of the furnishings, have been carried out by the students under the direction of their teachers. Notable examples of this type of demonstration have occurred for instance in Port Huron, Mich.; Buffalo, N.Y.; and Ames, Iowa. There have been several instances, also, of the actual designing and building of houses for

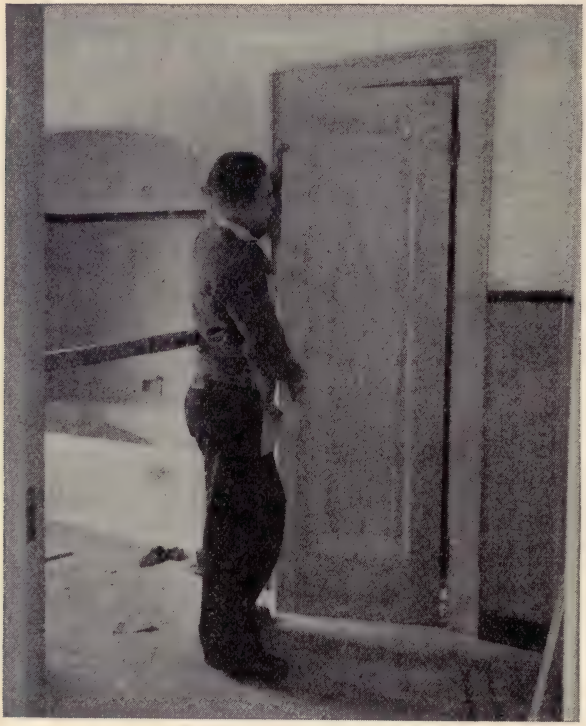

FIG. 80.—Hanging a door in the Akron, Ohio, "boy-built" house. Better Homes in America encourages the building of houses by schoolboys, in order that the best possible training may be given the next generation of home builders.

demonstration by boys enrolled in carpentry or other vocational classes in public schools, as in Utica, N.Y.; St. Helena Island, S.C.; Stockton, Calif.; and Akron, Ohio.

Negro committees have been organized in all of the southern states. In rural communities their programs consist largely in whitewashing or painting of homes, repair of fences, steps, and porches, and similar much-needed improvements, but at Hampton, Tuskegee, and other schools and

colleges for Negroes, more elaborate programs have been devised. The Penn School, on St. Helena Island, has been outstanding in the comprehensiveness of its programs conducted by a committee of Negro teachers and graduates of the school. Home economics cottages have been built and furnished by the students. Furniture and furnishings have been made for the demonstration houses, and contests conducted which are said to have led to improvements in every home on the Island. The activities of this committee are carried on throughout the year and it is reported that practically everything that is done is called a Better Homes project "since the words 'Better Homes' work magic on the Island."

Rural programs generally comprise contests followed by tours to prize-winning homes to witness and discuss the practical changes which have been made in each. In Pulaski County, Arkansas, for example, year after year, a large number of new or remodeled houses are demonstrated, furnished, or redecorated by members of the committee, and in some instances completely reconditioned by local citizens as a community project. In one case an old house, which for many years served as a storage barn, was completely made over by the citizens of Mablevale at a total cost in money of only $75. The convenient, artistic little home that resulted was still valued at considerably less than $1,000 and thus proved that good housing could be brought within the reach of the farm laborer's family. Several southern rural committees have demonstrated improvements in tenant cottages, and in the mountains of Tennessee remodeled log-cabins have been demonstrated; in Southern California homes of adobe and homes for Mexican laborers; in mining communities and industrial villages the reconditioning of homes of manual laborers.

The central office at Washington has issued a number of publications and educational news releases on house plans, home-ownership, home furnishing, on school cottages for training in home-making, boy-built houses, and memorandums on lawns, beautification of grounds, home-sanitation, and many other subjects. Extensive bibliographies have been prepared on those subjects on which inquiry is most frequently received, such as home improvement, remodeling, care and repair of homes, home-gardening, home music, home play, and in the course of a year tens of thousands of requests for information are handled.

During the past year State Committees have been organized in all the States and Territorial Committees in Hawaii and the Virgin Islands. There are several local committees also in Porto Rico and Alaska which devise programs adapted to the conditions of their own districts. A strik-

ing feature of the Hawaiian campaign was the building of a two-room model cabin which was mounted on wheels, taken over the Islands and demonstrated to the nat ve population.

Better Homes in America through its National office and state and local committees is able to reach citizens in virtually any community and let them know of the available sources of help both from Government departments and from private organizations. Through the local committees practical means of improving architecture, construction, landscaping, furnishing, equipment, or any other details of the home are demonstrated and the services of local specialists are rendered available both for arousing interest in specific improvements and for indicating the ways in which such improvements can be made. Not only the individual home but the community as well may be progressively transformed through such aid which discovers and utilizes latent abilities, trains new and effective leadership, imparts a new sense of values, and year by year raises standards of the home and of community civic life. [National headquarters of Better Homes in America are located at 1653 Pennsylvania Ave., Washington, D.C.]

AMERICAN HOMEMAKERS, INC.

Home-information centers have been organized in many of the New England states. Among the cities where well-organized centers now are in operation are Springfield, Cambridge, Holyoke, Waltham, and Boston of Massachusetts, and Providence and Newport of Rhode Island. In a number of other communities centers are in process. The purpose and activities of these centers are outlined in the following paragraphs taken from the organization's folder:

The activities of the Home Information Centers vary with the character of the community. All centers give information as requested by individuals and advice on the local opportunities for special training. At most centers classes in homemaking subjects are conducted. It is, however, the policy of the American Homemakers, Inc., to provide such classes only when the opportunity is lacking elsewhere in the community.

The essentials of a Home Information Center are:

A Director who has had special training, or intelligent homemaking experience, or both. She may be a paid or volunteer worker, but in either case she should feel the importance of her work, should know the needs and resources of her community and should meet family and personal problems with common sense and discretion.

The Home Information Center can be of immediate and practical service to men and women, whatever their income and previous education.

The Centers already established are serving as a source or channel for authentic and specific information on the house, its furnishings, equipment, and care; the individual and family income, its apportionment and use; the problems of food, clothing, recreation, child care, and child training. The Centers serve also as an "opportunity school" for active or prospective homemakers, wherein the instruction is adapted to the present needs of the individuals, as a coöperative center for all organizations dealing with the home, and as a clearing house for community opportunities.

The headquarters of the movement are located at the Eastern States Exposition Grounds, Springfield, Massachusetts. Mrs. James J. Storrow is president.

THE NATIONAL HOUSING ASSOCIATION

The purpose of the National Housing Association is to improve housing conditions in every practicable way. The Association also organizes associations and committees. It gives aid in educational campaigns, in the drafting, enacting, and enforcement of housing legislation, in the organization of improved housing companies, and also in continuing the work after the good standards have been established. The Association holds housing institutes in various sections of the country and an annual housing conference. It serves as a clearing house for information and publishes literature dealing with housing subjects. Its quarterly, *Housing*, contains information on housing development and housing progress. The Association is located at 105 East Twenty-second Street, New York City. *Officers:* Robert W. de Forest, president; John M. Glenn, treasurer; and Lawrence Veiller, secretary and director.

STATE AND LOCAL HOUSING ASSOCIATIONS

In a few of the states there are state housing associations organized to promote housing improvement. The Pennsylvania Housing and Town Planning Association, a volunteer organization, has been formed for the purpose of sponsoring a better housing program in the state of Pennsylvania. The citizens in over thirty counties have enrolled as members. One of the outstanding accomplishments of the Association has been the drafting of a permissive model housing law which has been enacted by the state legislature. The headquarters of the movement are located at Philadelphia. Benjamin H. Ritter is executive secretary. *Address:* 1701 Walnut Street, Philadelphia.

Both Massachusetts and Michigan have state housing associations.

In addition to these state associations a few cities have local citizens' associations organized for the purpose of promoting better housing and living conditions and better enforcement of housing legislation. The Better Housing League of Cincinnati which is supported by private contributions is a noteworthy example of such an association. This League carries on its work through visiting housekeepers who give instructions among tenants in the congested areas of the city and note and report violations. In addition, the League assists with housing and city-planning problems and the enforcement of legislation. It has worked out a special plan for instruction in housing for children in public schools. Bleeker Marquette is executive secretary. *Address:* 312 West Ninth Street, Cincinnati.

The Philadelphia Housing Association is another such organization. This Association's program varies somewhat from that of Cincinnati. Its activities are divided among such fields as housing legislation and law enforcement, municipal engineering, and education. In the field of law enforcement, for instance, the organization acts as a clearing house for fifty or more health and welfare agencies. The Association also has made a number of outstanding studies of such housing problems as congestion, vacancies, rental changes, demolition of dwellings, and other problems, depending upon the immediate need in the community. Bernard J. Newman is managing director. *Address:* 311 South Juniper Street, Philadelphia.

The Pittsburgh Housing Association, another volunteer organization, places its emphasis on the dissemination of information on housing and the particular housing problems of Pittsburgh. It is in reality a social agency and coöperates with the various social agencies in the community. In summarizing briefly the activities of the Association, John Ihlder, its director, states:

> Its function is to study, inform, stimulate, encourage. It has no power except that derived from knowledge and an informed public opinion. It coöperates with and supports those city departments whose function is to regulate the construction and use of residential property. It does not build or manage houses. But it holds conferences with and offers information and assistance to those who do. It hopes to prove itself an effective catalyst. Its method is that of steady, unremitting pressure, with the far future in view, as well as immediate improvement in living conditions both by official action and private enterprise.
>
> The policy of the Association is based upon a belief that housing progress is a gradual process, not a sudden revolution; that emphasis on different phases of

the work should vary with changing economic and social conditions; that housing betterment is a matter not only of the dwelling but also of the living standards and habits of the occupants of the dwelling.[1]

The Association is located at Pittsburgh. Mr. John Ihlder is executive director. *Address:* Granite Building, Pittsburgh.

CITY- AND REGIONAL-PLANNING ORGANIZATIONS

There are a number of national organizations which carry on a national program for the purpose of encouraging city and regional planning and assisting with problems in these fields. Some of the most outstanding are listed below:

The National Conference on City Planning gives advice on planning organizations and activities. It publishes bulletins on city-planning subjects and holds its annual conference. Flavel Shurtleff is executive secretary. *Address:* 130 East Twenty-second Street, New York City.

The purpose of the American City Planning Institute is to promote city planning and encourage original research on city-planning subjects. The Institute publishes an official organ, *City Planning* (quarterly). Flavel Shurtleff is executive secretary. *Address:* 130 East Twenty-second Street, New York City.

The Planning Foundation of America serves as a national clearing house for planning information. The Foundation issues bulletins, news releases, and editorials. Flavel Shurtleff is secretary and director. *Address:* 130 East Twenty-second Street, New York City.

The American Civic Association includes in its field land planning, civic improvement, and conservation. It publishes *Civic Comment* (bimonthly) and the *American Civic Annual* as well as a number of bulletins. Harlean James is executive secretary. *Address:* 901 Union Trust Building, Washington, D.C.

In addition to the foregoing, the Russell Sage Foundation, the National Municipal League, and the National Recreation Association, all of New York, include city- and regional-planning activities in their programs.

BUREAUS, OFFICES, AND DIVISIONS OF THE UNITED STATES GOVERNMENT WHICH PROMOTE HOME IMPROVEMENT

Owing to the fact that the Bureau of Standards carries on extensive research and many technological investigations that affect the home either directly or indirectly, considerable space has been allotted to a summary of that phase of the Bureau's work.

[1] *American Civic Annual, 1930*, pp. 79–80.

THE BUREAU OF STANDARDS

By HENRY D. HUBBARD
Assistant to the Chief, U.S. Bureau of Standards

[This article has been prepared by Mr. Hubbard for this publication]

Science and the power machine are exalting home life. Today motors trap house dust in a vacuum, take the effort out of sewing, clean our clothes and dishes, and in summer cool our food, and make breezes to refresh us. Science is behind many such services. At a motion of the hand a vibrant world of melody and knowledge invades our living room. Seated at ease we may converse with others across a continent or an ocean. We turn night to day with a tungsten thread. These and a score of Aladdin-like miracles we perform. With Science and technics we may make our own home environment what we will, giving the household the best conditions for perfect life.

That our yard, pound, and gallon come from our national standards at the Bureau of Standards is well known. It is not so well known that scores of other kinds of measurement rest on new types of standards or instruments. We rate electrical power in watts; electrical pressure in volts; light in candlepower, and food energy and heat we rate in calories. For these and many similar measures the Bureau must today have standards, units, instruments, and methods.

Measurements are everywhere needed to locate the home and to design, build, equip, and maintain it. This brings us many contacts on fundamentals. The use of such measures calls for researches and tests. The ideal standards of quality, performance, and practice must be measured ideals, for in the home technologies of today guesswork must no longer serve. Service must be built into the machines and structures to give predictable results.

This article tells of some ways in which the Bureau aids the activities and welfare of the home.[1]

The Bureau's experimental research on plumbing—so vital to household health—is credited as the most scientific treatment ever made. The published results aid home-builders in providing adequate, safe, economical plumbing facilities. Bureau researches and tests help to improve home-building materials through quality and service studies on cement, brick, tile, lime and lime plaster, stucco, paint, roofing, tiling, lightning rods, fabric, wall boards, and the like. The practice of plaster-

[1] The Division of Building and Housing, an outstanding Division of the Bureau of Standards, is discussed in the next article.

ing, stucco application, painting, and the installation of plumbing, gas service, electric service, and house construction have received careful experimental study. . . . .

To aid the household to protect the home from wear, weather, fire, lightning, noise, and other things, many researches and investigations have been undertaken by the Bureau. A popular 127-page publication on "Safety for the Household" deals with safety precautions to protect the home from electrical, lightning, gas, and fire hazards, and the dangers from chemicals and accidents. It was "designed to present the subject to adults and thus aid the growing movement for safeguarding life and property from avoidable accidents."

The Bureau's publication "Protection of Life and Property against Lightning" describes the history and technique of adequate protection against lightning, which causes many fires, especially of farm buildings. The damage to such property by lightning exceeds $20,000,000 annually. The Bureau of Standards points out how such losses can largely be prevented by the use of lightning rods properly installed, but that rods improperly mounted or without suitable ground connections are useless. The value of such protection for farm buildings having typical exposure was emphasized. One interest ng discovery was published on the proper grounding of wire fences to reduce the losses of livestock in open fields.

To safeguard the home from fire, the Bureau's researches on fire hazard contribute new data on the nature, causes, and avoidance of fires in homes. Actual conflagrations are studied for various purposes. The Bureau has a furnace in which can be burnt to destruction specimen house walls of most varied design and material—to perfect our knowledge of how to build homes with minimum fire hazards.

A special brick building is used at the Bureau to test the destructive effects on various kinds of equipment. In Washington, a large brick building and a smaller one next door were about to be dismantled to allow Government building operations. The Bureau, under close observation and measurement of temperatures throughout, burned them to complete destruction. Resulting data on the failure of the tin roof, brick walls, and floors enter into building practice to help perfect the design of houses. A construction such as a wall is rated on its ability to satisfactorily hold back fire and prevent ignition of combustible materials in contact with the side away from the fire. The length of time the wall affords this protection is determined in a standard furnace test.

The fire resistance of building materials and construction is determined

by subjecting them to a test fire, the intensity of which is regulated so that given temperatures in the furnace obtain at stated times after the fire is started. Even the garage—now often built in or attached to the house itself—was not overlooked, and the standard of "one-hour fire resistance" was suggested by the Bureau of Standards to assure adequate safety.

Compiled data on seasonal variations in fires, on fire resistance in dwellings, and on the fire hazard from discarded cigarettes, cigars, and matches were published with suggestions for reducing such hazards. Many researches are conducted which sooner or later are reflected in technical details of home construction. In the experimental fires, for example, the Bureau has studied the hazard of shingles, how roofing fails, how embers are formed and carried by the wind, the temperatures of fires, and a score of subjects vital to home safety and economy. Such data find their way through building codes into practice, or through the designers of equipment, or the architects of dwellings.

On the roof of the Bureau's chemistry laboratory sheets of various colors are exposed to natural weather day by day, month by month. Paints are having their fortunes told, for some will live or die commercially by these tests. Inside the same laboratory "accelerated tests" of similar paints are in progress. Weather affects coated surfaces—a vital problem in the life of structures. Among materials tried out as protective coatings are oil paints, enamel paints, lacquers, bituminous saturated felts, and bituminous roofing materials. The accelerated weathering test is similar to and more rapid than actual weather exposure. Artificial rainfalls on the specimens followed by artificial sunlight rich in ultraviolet simulate the destructive forces of weather and play in repeated sequence on the painted specimens. Outdoor exposure tests and indoor "accelerated tests" thus tell pertinent factors as to how paints hold up under weathering. Such new facts for the paint industry eventually help the household more effectively and durably "to save the surface" and thus add longer life to the home.

The Bureau has studied means for cleaning marble, and how to minimize disfigurement of the exterior of the house. Soluble salts in masonry materials often disfigure walls by efflorescence. Efflorescence is often attended by disintegration of material, particularly mortar. It was found that moisture in the wall is the immediate cause, and that moisture penetration can be lessened by proper design, construction, and maintenance. If may appear and disappear for a few seasons, but with each successive

appearance gradually diminishes in extent until finally it never again becomes noticeable.

Quiet—the laudable goal of modern anti-noise crusades—is essential to restful home life. The Bureau has helped fundamentally by measuring the sound transmission properties of some 26 kinds of wall and floor of various materials and internal design. This research gave new light on how to minimize the invasion of noise through walls and floors of rooms. Ways are now known for making practically sound-proof walls and floors, and home and apartment house designers are furnished data needed for building quiet into the structure as effectively as we build strength. Further research will add new data on this subject.

In the course of the experiments silver tarnish, identified as silver sulphide, was made in quantity, made up into wire and found to possess interesting electrical properties. The Bureau later has jointly with other agencies helped to produce a tarnish-resistant silver—a practical step toward a non-tarnishing silver. Again the Bureau, upon request, aided the makers of enamelled-metal kitchen ware by finding the cause and cure for the chipping or flaking which marred the ware and actually threatened the industry. Research on the relative expansion of the metal and the enamel disclosed that unequal expansion caused the "fish-scaling" as it was called. New technique in cleaning and applying the enamel and a new formula for the enamel were developed in experiments in which forty thousand specimens were produced and studied. The housewife using enameled metal ware will be interested to recall that science and technics at the Bureau of Standards helped perfect the art of making such ware.

The household draws to its service many arts and sciences, and such services will multiply as we intelligently use all means now so available and so potent for human well-being. The era of artificial refrigeration actively began coincidently with the completion of the Bureau's precise determination of the properties of refrigeration materials—data essential to and underlying scientific refrigeration, and the design and construction and operation of refrigerating devices. Today, with two thousand new refrigerating devices each day entering American homes, machine-made cold has become a household product. It is now possible to install in the home scientifically designed power-driven cold-producing machines. The Bureau of Standards' series of classic researches on the refrigerating properties of materials has contributed in no small measure to this end. Active

years of research yielded accurate technical data unsurpassed elsewhere by any similar research in other branches of engineering..

As early as 1904, the Bureau controlled the humidity of its electrical laboratories, blowing the air against radiators cooled below the freezing point of water by calcium chloride brine. This froze the water out of the air, thus drying it. Many inquiries were answered concerning this Bureau provision of air-moisture control—then a laboratory necessity, now an industrial service, an aid to health and comfort in our great theaters, and slowly coming into the home, to add comfort for the family.

Perhaps dust-free air, of optimum temperature, humidity, and motion, may eventually be supplied as every-day practice in the home for the sake of the household, as is already done in scores of industrial operations for the sake of the material products. In the control of air conditions for research in many lines, e.g. in its paper testing and textile testing laboratory, altitude chamber for simulating high altitude condition, and elsewhere, the Bureau has helped show that air control is feasible. Controlled climate indoors will doubtless become as much an object of home technology as house heating in winter.

Again, if roofs were white outside and aluminum painted inside, attics would be cooler in summer and warmer in winter. This was discovered by the Bureau of Standards from measurements of the radiative and reflective properties of materials. Attics cool in summer and warm in winter may add a fifth to the habitable space of the home. If suitable heat insulation is applied under the roof, such livable attics could more easily be attained.

The walls of the home are built to keep out wind, rain, and snow. Summer heat and winter cold still force their way in, bearing bodily discomfort and ills. The Bureau is helping toward a more ideal indoor weather by measuring accurately the heat transmissive quality of various materials. A useful letter-circular gives the results and has been distributed by thousands to aid home-makers and house designers to build temperate conditions into the home. With these data artificial heat can be kept indoors and summer heat kept outdoors more effectively. Economy is the welcome partner of comfort from heat-insulating walls since coal bills may often be cut down one-third if recommended precautions are taken.

All households in America are daily buyers of industrial products. They are America's largest buying group but lack expert knowledge of what they buy and of how to buy wisely. The national Government is the next largest buying unit. The seventy-two technical committees of its Federal

Specifications Board formulate quality-describing specifications, to govern federal purchases. Its 584 Government master specifications cover some 4000 items, hundreds of which are of direct interest to the buying household. The Bureau has put successfully into effect its famous "certification plan" to aid household buying. Under this plan the Bureau publishes a "willing-to-certify" list of firms willing, when requested, to deliver goods certified to conform to the U.S. Government master specifications. Over a thousand firms have registered for this list. This gives the benefit of the Government's specifications to all who wish to use specifications. To this plan is added the system of "self-identifying quality-guaranteeing labels" under which the products and their sale are brought within the purview of the agencies which safeguard the buying public from misbranding and mislabeling commodities.

Full weight and measure in marketing concerns every householder. Accurate deliveries over the counter depend on the National Bureau of Standards along four principal lines: First, through its standardization of the shop standards by which trade measures are made; second, through its standardization of the State standards with which local "sealers" standards are inspected and verified; third, through annual conferences of State and national officials, encouraging the adoption of the model State law, standard tolerances, and adequate local inspection; and fourth, by information to the household and the inspectors. These four activities have since 1901 steadily developed what is now a nation-wide interest in full weight and measure in the markets in the interest of the buyer. As aids, the Bureau has published and widely distributed for the use of the household: "Buying Commodities by Weight and Measure," "Measurements for the Household," and a kitchen card. The first helps the household in methods of buying with special regard to quantity measurements. The Bureau's kitchen card for the household gives tables of weights and measures, equivalents of the units of measurement used in cooking, standard heights and weights of children at each age, and other facts. The Bureau's hand-book for sealers is the reference work for the local inspectors throughout the country.

Practically everything used by the household calls for measurements, and accuracy is essential to fair dealing, and oftentimes to utility. All of us as buyers pay the last cent due in a purchase, so equally the last ounce due should be assured to the purchaser. Large buyers check the weight and measure of all deliveries. Households rarely do so but rely on the

sealer and tradesman for correct measure over the counter. The Bureau's nation-wide campaign for honest weight and measure is saving buyers millions of dollars formerly lost through short measure. State laws and local inspection services are now general and the household is freer from preventable injustice.

The Bureau's simplified practice division aids the household by stimulating the industries to simplify sizes and varieties of many household articles—beds, springs, mattresses, sheets, bed blankets, table chinaware, and others. Here the more acceptable sizes (as reflected in the sales) were retained on the manufacturers' schedules. A notable success was in simplifying and standardizing builders' hardware, latches, bolts, locks and keys, knobs, sash pulleys, brackets, umbrella holders, chest handles, and so on. Through the efforts of the simplified practice unit of the Bureau the industry has reduced the sizes and varieties of brick from 66 to 5 in the nation-wide elimination of waste activity of the Department of Commerce. Simplification has been attained even in such details as the milk and cream bottles (now reduced to four kinds) and bottle caps (now of one size).

Clay products from bricks to chinaware, from terra cotta drain pipes to the beautiful tile of the bathroom, are of concern to the household. White glazed tile and unglazed ceramic mosaic were simplified, terms defined, and form of certification was agreed upon. Sets of chinaware for hospital and hotel use have been selected so as to give a simplified set of general service utility. Weights, widths, and lengths of bedsteads and bed linen have been concurrently simplified to promote economy in production and sale. . . . . In all, some 86 commodities are now simplified as to size, grade, and variety. Such simplifications effect many economies, facilitate replacement, and assure benefits such as come from even partial standardization.

The Bureau has designed and built an apparatus to simulate the wear of carpet in service. Two leather-faced abrading wheels give the stress and a vacuum-cleaner picks up the abraded material which is a measure of the wear.

The code of gas practice has given basic data to local governments for effective and safe control of gas service. The Bureau has made experimental and field studies of gas hazards and the efficiency of gas appliances. The consumers and the manufacturers have shown interest in this work and felt the stimulus to design more efficient appliances. In household

practice the Bureau's circular on "How To Get Better Service with Less Natural Gas in Domestic Gas Appliances" showed that two-thirds of the natural gas then used in the home could be saved by using the type of burner devised and recommended by the Bureau for the purpose. The burner was found to have an efficiency several times that of the type in common use. The saving made possible (at replacement value) was estimated as $250,000 a day, when the Bureau's suggestions are adopted. The effects of changes in the heating value of gas furnished to the home were described in another published paper. Optimal conditions for efficiency, capacity, and safety of burners were designed for the domestic use of two of the newer fuels known as propane and butane. A study was also made of the efficiency and safety of acetylene burners. At one of the national conventions of the American Gas Association the Bureau exhibited methods of utilizing natural gas and the best types of burners to use. The serious hazard from the presence of carbon monoxide in the air was made the basis of extended experiments and data for municipal regulations concerning the inspection and safety of gas appliances in the home.

. . . . Engineers of State Utility Commissions [have] met at the Bureau to discuss problems of residential use of gas and electricity. The Bureau's service of standardization for water, gas, and electric meters has brought uniformity and helped to maintain accuracy in the measured service of electricity, gas, and water—satisfying both to the household and to those who furnish such service—minimizing disputes, complaints, and promoting good will in the assurance of full measure to the home. The Bureau's work on meters for electricity, gas, and water is chiefly in certifying the standards or standard instruments used to control the accuracy of manufacture and adjustment.

We have completed our survey and seen some of the ways in which the National Bureau of Standards aids the home. Its 60 or more specialized lines of research of interest to the household could not be fully told here. The examples described may give an idea of what the two cents per capita spent for our National Bureau of Standards is doing for American homes—one, not the least, of the many beneficiaries of its research activities.

THE DIVISION OF BUILDING AND HOUSING[1]

By JAMES S. TAYLOR
Chief, Division of Building and Housing, Bureau of Standards
U.S. Department of Commerce

The Division of Building and Housing was established in the Department of Commerce in 1921, when the country had not yet recovered from the wartime housing shortage, and when there were, at the same time, millions of unemployed men walking the streets. That situation showed graphically how the country must depend upon an economical, smooth-functioning construction industry if housing standards are to be steadily improved, and if reasonable stability in business is to be achieved.

Creation of the Division was the culmination of efforts made during several years to have the federal government set up such an agency.

The idea that the federal government should cooperate on a voluntary basis with business and other groups in policies having the dual aim of relieving the housing shortage by means of new construction, and furnishing employment, had been publicly advocated by Herbert Hoover in November, 1920, and shortly after taking the office as Secretary of Commerce in March, 1921, he announced such cooperation as one of the Department's policies. He recommended an appropriation for the work, following the lines suggested by the Senate Committee, and in the measures then pending before the two houses of the Congress. This appropriation was granted in a bill passed in June, 1921.

An Advisory Committee on Building Codes consisting of nationally known architects and engineers was set up in the same month, and the Division itself was established on July 1 with the general aim of aiding in the solution of such outstanding problems as stabilizing building activity, more satisfactory development of urban areas through zoning and city planning, eliminating wastes in building, and encouraging home ownership.

Sustained and healthy construction activity is essential for stable employment, rising living standards, and the general prosperity of the country. The American people have been spending from six to seven billion dollars a year, or nearly one-twelfth of their income, for construction during the past five or six years.

It is fundamental that this construction be carried out economically,

[1] Adapted from *The Division of Building and Housing and Its Services* (mimeographed circular issued by the Division).

and at a fairly even rate, not accentuating the ups and downs of general business and employment, but, if possible, acting as a balance wheel by speeding up when other business is slack.

Construction materials, including lumber, cement, steel, and many other vegetable and mineral products, are produced in practically all sections of the country and furnish about an eighth of the total railway freight carried. A decrease in building activity, therefore, is quickly and widely felt, while an insistent over-demand at any one time may lead to an inflationary boom with inevitable reaction.

SEASONAL OPERATION IN THE CONSTRUCTION INDUSTRIES

In coöperation with a committee of the President's Conference on Unemployment, the Division in 1923 and 1924 made an extensive survey of seasonal operation in the construction industries. The committee represented business and professional men, contractors, building material producers and dealers, building trades labor, real estate men, bankers, engineers, and architects.

The study showed that construction usually reached a peak in the summer months, from which it receded as cold weather came on. As a consequence workers in leading building trades, such as carpenters and bricklayers, were fully employed for only a few months, beginning about June or July, while contractors and material dealers were forced to adjust their business accordingly.

It was shown that the building season could be lengthened out into the spring and fall months, and further that construction in winter was both feasible and economical. Custom rather than climate appeared to be the reason for prevailing conditions.

Subsequent studies by the Division indicate that more and more construction is taking place in the winter months, with consequently steadier employment for building trades workers. Customs which tend to throw the greater part of construction into certain months, such as the existence of a fixed leasing date, are being vigorously attacked in many cities.

MUNICIPAL BUILDING AND PLUMBING CODES

More than 850 local building and plumbing codes prescribe the conditions under which approximately three billion dollars' worth of building construction is carried out each year in the United States.

These regulations are designed to assure structural safety in buildings and to reduce hazards to life and property, but they often require the use

of excessive amounts of material, or fail to assure safety. Rapid development in design, better knowledge of the properties of materials as a result of research, and the development of new materials, or the adaptation of old materials to new uses, have made many existing provisions obsolete.

Individual cities are not equipped to do the extensive research necessary to put code requirements upon a complete scientific basis. The Advisory Committee on Building Codes, appointed by the Secretary of Commerce in 1921, and composed of engineers and architects of national reputation, has issued six reports dealing with small dwelling construction, plumbing, masonry walls, allowances for live loads in design, working stresses for timber, steel, concrete, and cast iron, and arrangement of building codes. A report on fire resistive construction has also been completed.

In many cases tests were undertaken at the Bureau of Standards to clear up doubtful points, and investigations of the actual performance of various materials under different circumstances in actual construction had to be made.

The general acceptance of the reports as authoritative is shown by their use, within six years from publication of the first bulletin, by bodies formulating or revising ordinances in more than 200 cities and in model or mandatory codes in seven states.

That further use will be found for them is indicated by a recent survey in which it was reported that more than 200 cities are engaged in revising their building codes and more than 100 in revising their plumbing codes.

ECONOMIC, STATISTICAL, AND INFORMATIONAL SERVICE

In promoting stability, the Division collects and makes available basic statistics on building activity, and on production, consumption, and stocks of building materials, for the guidance of business groups. It publishes periodic reviews of construction activity, collects, in conjunction with the Census Bureau, retail prices of building materials as paid by contractors in about 50 cities each month, and makes special reports from time to time. It cooperates with the Division of Public Construction of the Department of Commerce, and with various national and local organizations in gathering, tabulating, and analyzing statistical data of interest to the construction industry.

The Division also cooperates with the Survey of Current Business in the Bureau of the Census in presenting monthly statistics relating to construction and building materials. It answers inquiries from individuals,

companies, and trade associations, interested in construction and puts them in touch with non-governmental as well as governmental sources of information.

BUILDING PRACTICE AND HOME BUILDERS' PROBLEMS

In connection with building practice and home builders' problems, the Division conducts surveys and distributes information on trends in small dwelling construction, reporting on materials used, details of construction, design, and equipment, and dimensions of rooms and parts of representative houses. This service is intended for home builders, operative builders, material and equipment dealers and manufacturers, and others interested in small houses.

Information on care and repair of the house, and on planning a home has also been assembled for publication. Inquiries upon these subjects are largely from prospective house builders and present house owners who want reliable unbiased answers to their problems. No attempt is made to advocate use of trade-marked products or special materials by name, but rather to point to the best practice for use of a given product.

STANDARD STATE MECHANICS' LIEN ACT

It has been believed by many persons interested in the construction industries that considerable delay, annoyance, and expense could be avoided if there were greater uniformity in the mechanics' lien laws of the various states. At the request of a number of organizations of builders, material producers and dealers, and real estate owners, the Secretary of Commerce appointed a committee composed of representatives of these groups and of subcontractors, building trades labor, architects, engineers, and financing and surety groups. They have undertaken to draft a mechanics' lien act which can be used as a basis for uniform state legislation.

The first tentative draft of an act was distributed to qualified individuals and organizations for criticism and a second tentative draft, prepared in the light of suggestions received and other information, was circulated in like manner. Suggestions relative to this second draft are now being considered with a view to perfecting the act. Cooperation is maintained with a committee of the National Conference of Commissioners on Uniform State Laws, appointed to consider the same subject.

CITY PLANNING AND ZONING

City planning and zoning have commanded a much enlarged interest in recent years because of the desire to stabilize values of real estate, the

wish to promote orderly growth and to eliminate waste, the greatly augmented building program, the larger proportion of apartment houses, and the growing problem of street traffic congestion.

In 1921, zoning ordinances had been enacted in a few cities, regulating the height of buildings, the area of the lot which they might cover, and the use to which they might be put, with varying regulations for different districts of the city. These had met the desire of cities to preserve residential districts free from wanton intrusion by large public garages or sporadic stores and apartment houses, and to keep apartment house and business districts free from intrusion by noisy industries.

The Advisory Committee on City Planning and Zoning, appointed by Secretary Hoover to work with the Division of Building and Housing, accordingly set forth the possibilities of city zoning in popular style in "A Zoning Primer," which has been characterized as the most influential single publication in the field.

There was at the time grave danger that so novel and far-reaching a means of public control over private property might develop along unsound lines; and the committee drafted a Standard State Zoning Enabling Act which, when adopted by a state legislature, permits municipalities to enact zoning ordinances under proper safeguards.

In 1921 when the Advisory Committee on City Planning and Zoning commenced its work, there were about 60 zoned municipalities. At present there are more than 900, ranging in size from villages of a few hundred inhabitants to Chicago and New York, and comprising a total of more than 46,000,000 inhabitants, equal to more than two-thirds the urban population of the country.

The Division has made a number of careful surveys of zoning progress and city planning activity in the United States, and handles a large number of inquiries from civic bodies, municipal officials, and individuals interested in these subjects. Recent publications include "A City Planning Primer," and "A Standard City Planning Enabling Act," which latter has served already as the basis for city planning laws adopted in a number of states.

Such acts permit municipalities to create city planning commissions, control the layout of new subdivisions, prevent building in the bed of mapped streets, and authorize the creation of regional planning commissions for cities, or groups of cities, and the territory surrounding them.

HOME OWNERSHIP

One of the principal aims of the Division is to encourage home ownership on a sound economic basis. In acquiring a home, a family usually learns habits of saving for a definite end, and develops more of a sense of civic responsibility. Home ownership also stimulates a continued demand for new dwellings, and promotes interest in sound construction.

Residential building has amounted to more than 40 per cent of all construction in the United States during the past five years and the Division's work on building codes and city planning and zoning all tends to make a higher percentage of home ownership feasible.

The Division has also given substantial assistance to Better Homes in America, an educational organization with headquarters in Washington, which aims, among other things, to make available to several thousand voluntary "Better Homes" committees throughout the country information from government sources.

THE BUREAU OF HOME ECONOMICS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE[1]

BY ROWENA SCHMIDT CARPENTER
Associate Specialist in Home Economics

The Bureau of Home Economics was created July 1, 1923, to meet the need of 26,000,000 homemakers in the United States for help in solving the problems they face daily. For many years the Department of Agriculture had carried on investigations in nutrition and experiments in the preparation, canning, and use of food materials, in a division called the Office of Home Economics. This was expanded into a Bureau in order to widen the scope of the work and make more fundamental studies possible.

The research of the Bureau is organized under three divisions: Foods and Nutrition, Textiles and Clothing, and Economics. The primary function of each division is the solution of problems for the homemaker through scientific research. Some of these problems require long investigation; others are less complicated, but their solution in any case contributes toward greater comfort and satisfaction in home life. Many projects deal with nutrition, food preparation, and clothing standards, and are related to the personal requirements of members of the family

[1] This article was prepared for this publication.

group. All of the numerous and varied pieces of research and resulting publications of the Bureau may be said to tie in with the Better Homes movement in its larger sense. More specific home-improvement suggestions will be available from the Bureau in future years when expansion allows for the development of a division for housing and equipment studies and another to consider art as it is related to the home. In considering for these pages the studies now under way that contribute to the physical aspect of the home environment the list seems somewhat limited.

The Division of Textiles and Clothing, in its work on the utilization of wool and cotton, is conducting projects dealing with the care and uses of textile materials. These include studies on the laundering and cleaning of cotton and wool materials used in home furnishing. Certain studies have had as their object the development of recommended practices in home laundering and stain removal. Facts on these subjects are published for the homemaker in Farmers' Bulletins 1474, *Stain Removal from Fabrics: Home Methods*, and 1497, *Methods and Equipment for Home Laundering*. Studies of design as related to home furnishing (carried on co-operatively with the Extension Service) are giving special attention to the use of household textiles. The results will be published in a series of popular publications, two of which are now ready for distribution: Farmers' Bulletin 1633, *Window Curtaining*, and Leaflet 76, *Slip Covers*. Two slide sets, "A Guide to Fabric Selection" and "First Aid in Window Curtaining," have been prepared. They are sent out to clubs on request to the Office of Coöperative Extension Work of the United States Department of Agriculture. A set on living-room arrangements is in preparation.

The Bureau has coöperated with the American Home Economics Association in its effort to secure some method such as labeling whereby information on quality specifications of consumer's goods may be available for the homemaker. A pamphlet entitled *Household Purchasing: Suggestions for Club Programs* has been prepared and is for sale by the American Home Economics Association, Mills Building, Washington, D.C. The Textile Division of the Bureau has made some studies on the standardization of household textiles and has published two articles along this line: "Some Specifications of Wide Cotton Sheetings Bought on the Retail Counter," *Textile World*, LXXVI, No. 9 (1929), 53, and "Where Sheets Wear Out," *ibid.*, LXXV, No. 15 (1929), 69.

The Division of Economics considers the standards of living prevailing in different types of families, the costs of maintaining these standards, including the cost of housing, and the organization and efficiency of the work of the home under varying conditions. Practical methods of budget-

ing and accounting are being devised to aid the homemaker in the management of her family finances. Suggestions for keeping household accounts are given in Farmers' Bulletin 1553, *Planning and Recording Family Expenditures*.

Closely related to and determining somewhat the money expenditure are time and energy expenditures. These are in turn affected by the type, amount, and arrangement of equipment for carrying on household duties. Arranging the kitchen for efficiency is discussed in Farmers' Bulletin 1513, *Convenient Kitchens*, and in an article, "Abolishing the Inefficient Kitchen," in the *Journal of Home Economics*, XXI (1929), 475. There is also a set of eight charts called "The Convenient Kitchen," for sale by the superintendent of documents, Government Printing Office, Washington, D.C.; and a set of lantern slides, "Come into the Kitchen" which may be borrowed through the Office of Coöperative Extension Work.

Records have been collected from both rural and city homemakers on the way they distribute their time among their various household tasks, including the care of small children. These records cover facts about the size of the house and the amount and type of labor-saving equipment the woman is using. A popular discussion of the time studies may be found in the articles "Is the Modern Housewife a Lady of Leisure?" *Survey*, LXII (1929), 301; and "Reducing the Demands of Housekeeping," *Child Welfare Magazine*, XXI (1927), 380. Studies are also under way to determine the relative costs of having work done in the home with or without modern equipment and of having it done by a commercial agency.

The work of the Division of Foods and Nutrition concerns itself mainly with the finding of facts upon which to base standards of nutrition and food utilization and care. Any study of equipment is incidental to the foregoing investigations. Researches on food care and storage have developed a great deal of material on home refrigeration and canning equipment. Farmers' Bulletin 1471, *Canning Fruits and Vegetables at Home*, describes and pictures the types of canning equipment recommended by the Bureau. Published material on refrigerators consists of a set of six charts, "Household Refrigeration," for sale by the superintendent of documents; a bibliography, "Household Refrigeration," distributed by the Bureau; and several articles: "Research on Home Refrigerators," *Refrigerating Engineering*, XVI (1928), 41; "Temperature and Ice Consumption in an Ice Cooled Refrigerator as Affected by Room Temperature," *ibid.*, XVIII (1929), 93; "Test of Five Ice-cooled Household Refrigerators," *Ice and Refrigeration*, LXXVIII, No. 1 (1930), 49.

Facts determined by scientific investigation in the three divisions of

the Bureau are available to homemakers in bulletins, in charts, and in magazine articles as mentioned above. A complete list of bulletins, sent on request, shows the scope of subject matter available free to homemakers. Hundreds of letters in which homemakers ask their specific questions are answered each week. Information goes out also through releases to the press and through two types of radio programs, one given each week over a national network of about thirty-nine stations and the other mailed five times a week to be read over more than one hundred and thirty local stations in various parts of the United States. The Bureau is in touch with homemakers indirectly through the extension agents in the Department appointed under the Smith Lever Act, who through their club programs carry information from Bureau studies. Technical as well as popular bulletins and the illustrative material prepared in the Bureau are used by home-economics departments in the training of teachers, extension leaders, and prospective homemakers all over the country.

OFFICE OF COÖPERATIVE EXTENSION WORK, VISUAL INSTRUCTION, AND EDITORIAL WORK

By C. W. WARBURTON
Director of Extension Work

A farm home, adequate, comfortable, beautiful in harmony with its natural setting, reflecting the interests and ideals of the family it shelters, is the goal toward which the whole coöperative extension program tends. Success in the business of farming is sought, just as success in any other business is sought, in order that all interests of the home may benefit. Not least of these interests is the physical make-up of the home, the house, its furnishings, its equipment.

Farm women who participate in the undertakings of the cooperative extension service frequently request that attention be given to specific features of home improvement. Among the extension projects relating to home improvement included in the programs of many states this year are:

- House plans
- Lighting
- Water supply, sewage, sanitation
- Storage facilities
- Refrigeration
- Electrical equipment
- Kitchen equipment
- House furnishings and selection of furniture
- Repair and refinishing of furniture
- Arrangement of furniture
- Wall and floor finishes
- Beds and bedding
- Curtains
- Handicrafts, color, dyeing, etc.
- Pictures for the home
- Planting and care of the home grounds

Methods of conducting the projects vary with the state. Frequently the county home-demonstration agent arranges one or more lectures and demonstrations to be given before groups of women by a member of the extension staff at the state college who has specialized in that subject. Illustrative material is usually brought by the specialist. Sometimes local people coöperate in giving demonstrations and discussions of furnishings, equipment, and materials. Contests in improvement of certain features of the home, such as kitchen, living room, or grounds, afford an added interest to the program occasionally. Tours to visit the entries in the contest provide a means of obtaining information which many non-contestants, as well as those who are in the contest, avail themselves of.

Special emphasis is given this project by the National Better Homes Week. County home-demonstration agents join with other agencies in the county in planning and carrying out programs for this week. Frequently the home-demonstration agents plan a special demonstration for this week. In one county in Virginia as a special feature for Better Homes Week an old house was made available to the women working with the county home-demonstration agent, and together they remodeled and placed in it furniture and equipment loaned by business firms of the county. During the week the women took turns acting as hostesses in the demonstration home. In Tennessee the home-demonstration agent reports that ideas gained from a somewhat similar demonstration, carried out several years ago, are still being put into practice.

THE DIVISION OF AGRICULTURAL ENGINEERING

In addition to the above-mentioned governmental activities in the field of housing and home improvement the Division of Agricultural Engineering of the Bureau of Public Roads has been engaged in studies and research on the Requirements of Farm Structures. A small number of farmhouse plans have been prepared by the Division, and information is distributed in pamphlet form on such subjects as heating and plumbing. The bulletins *Construction of Chimneys and Fireplaces*, *Operating a Home Heating Plant*, *Farm Plumbing*, and *Simple Plumbing Repairs* are some of the Division's publications of particular interest to home owners.

THE BUREAU OF MINES

The Bureau of Mines of the United States Department of Commerce has made a number of studies on household fuels and fuel conservation and also on house heating. This information may be obtained from the Bureau in pamphlet or leaflet form.

INDEX

INDEX

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